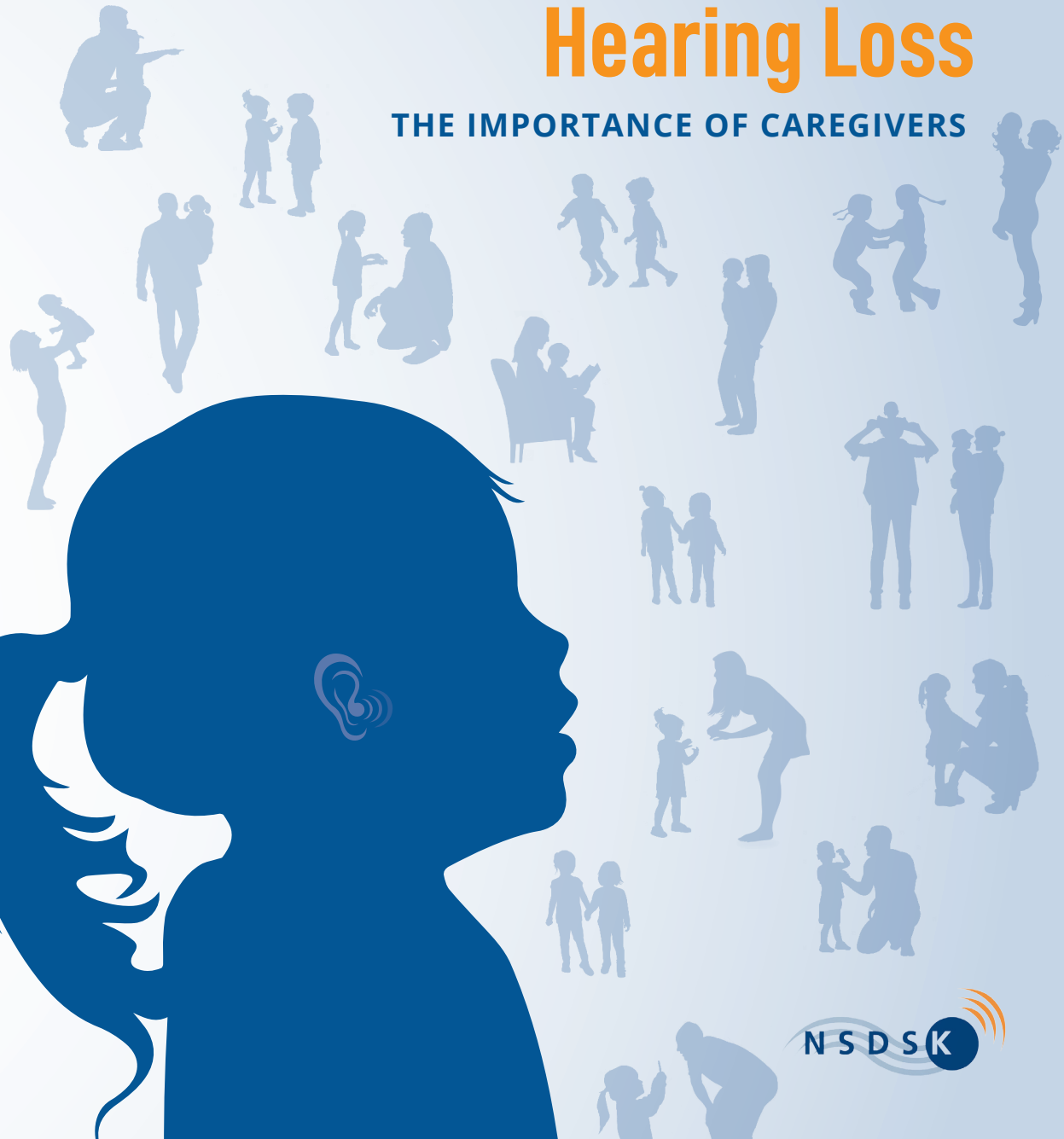
Evelien Dirks

# Psychosocial Functioning in Toddlers with Moderate Hearing Loss

## THE IMPORTANCE OF CAREGIVERS



NSDSK

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**Psychosocial Functioning in Toddlers with Moderate Hearing Loss**
The Importance of Caregivers



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# Psychosocial Functioning in Toddlers with Moderate Hearing Loss

## THE IMPORTANCE OF CAREGIVERS

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*Voor Esmee en Anouk*

CHAPTER 1

# Introduction

Hearing ability is important for children to develop language, communication, and social-emotional skills as they grow up. Approximately one child in a thousand is born with permanent bilateral hearing loss (HL) (Korver et al., 2011; Zoutenbier et al., 2016). In the Netherlands, this means about 180 children each year, of whom over 50% have a moderate HL (MHL)(40-70 dB) (Zoutenbier et al.). Permanent bilateral can be caused by genetic factors (40%), acquired factors (30%), unknown causes (25%), or miscellaneous causes (5%) (Korver et al.). In this thesis the impact of MHL on young children's language and social-emotional outcomes in the context of their caregiving environment is examined.

Children with HL encounter challenges while growing up in a sound-dominated society. Auditory access is an important factor in enabling human beings to communicate with others and receive social information. Spoken conversations, for example, are usually between 40 and 65 dB and thus have limited accessibility even for children with MHL. Hearing aids offer children with HL more access to sound and speech, but in noisy environments they still encounter difficulties in perceiving auditory information. This restricted access to sound and speech puts children with MHL at risk of developing language difficulties (Tomblin et al., 2015) and social-emotional difficulties (Stevenson et al., 2015; Theunissen et al., 2014).

**Children with MHL: forgotten children?**

Before the introduction of newborn hearing screening (NHS) (introduced in the Netherlands in 2005), deaf children were on average about one-and-a-half years old when their hearing loss was first identified, and children with MHL were even older. Nowadays, most children with HL are diagnosed within the first few months of life, which allows for much earlier intervention. This is important, because early family-centered intervention (FCEI) has been shown to have a positive effect on the language and social-emotional outcomes of children with HL (Ching et al., 2017; Holzinger, Fellinger, & Beitel, 2011; Moeller, 2000; Yoshinaga-Itano et al., 1998).

The Netherlands has a long tradition of family-centered early intervention for deaf children and their families. Following the introduction of the NHS in 2005, early interventionists who were used to working with deaf toddlers now had to adapt their programs to the needs of deaf babies and their families. In 2008, the inclusion criteria for family-centered early intervention for children with HL were broadened, allowing children with less severe HL (MHL) to enroll. However, it remained questionable whether family-centered interventions for deaf children would also be beneficial for children with MHL. Given that children with MHL have better auditory access than deaf children, other interventions might be more effective to promote their language and social-emotional development.

At that time, limited evidence was available to answer the question of whether the existing family-centered interventions were also suitable for children with MHL. Few studies focused specifically on children with MHL: most concerned children with profound HL or

included children with a broad range of HL (i.e., from mild to profound HL). The gap in research concerning and interventions for children with moderate to severe HL was apparent as early as 1977 when, in her seminal work, Julia Davis referred to this group as "Our forgotten children" (Davis, 1977). Davis advocated a stronger focus on MHL particularly because, since these children speak relatively well and often have successful interactions with others, adults may underestimate their needs. A study by Davis and colleagues (1986) on the outcomes of 40 children with mild to severe HL showed that these children were indeed at risk for language and social-emotional difficulties. Recently there has been increasing attention in the literature for young children with MHL (e.g., Ambrose et al., 2015; Koehlinger, Horne & Moeller, 2013; Laugen et al., 2016; Moeller & Tomblin, 2015; McCreery et al., 2015; Netten et al., 2017; VanDam, Ambrose & Moeller, 2012). The results of these studies have shown repeatedly that children with MHL are at a higher risk for language and social-emotional difficulties than their normal hearing peers.

**Inconsistent access to linguistic and social-emotional input**

The auditory environment in which children grow up shapes their language development. Children pick up speech from the people around them and learn language by interacting with them. For example, they learn to discriminate speech sounds, understand the meaning of words, produce words, and learn the rules of their language. When access to speech is restricted, children have reduced linguistic experiences and are consequently at risk for language difficulties. Several studies have reported lower language and speech abilities for children with MHL compared with peers with normal hearing (NH) (Ambrose Vandam & Moeller, 2014; Davis et al., 1986; Hammer & Coene, 2016; Koehlinger et al., 2013; Tomblin et al., 2015). These studies point to lower language abilities (Tomblin et al.), weaker consonant production (Ambrose et al., 2014), and poorer grammatical outcomes (Hammer & Coene; Koehlinger et al.).

Moeller and Tomblin and their team (2015) propose a model of inconsistent access (MIA) (See Figure 1), in which they hypothesize that children with mild to severe HL experience limitations in their access to linguistic input. This inconsistent access results in limited potential for linguistic uptake, which in turn increases the risk that children with MHL will miss out on opportunities to learn language. Over time, these limited opportunities accumulate and reduce the children's cumulative linguistic experiences, which affects their language development. Moeller, Tomblin and colleagues used MIA as a central hypothesis in their longitudinal research project on the speech and language outcomes of children with mild to severe HL (OCHL) (for an overview of this research project see Tomblin et al., 2015). The researchers explored three factors that might influence these children's access to linguistic input: aided audibility, consistency of hearing aid use, and caregiver linguistic input. The results of the OCHL project supported their hypothesis: Children with MHL were shown to have poorer language outcomes than their peers with NH, and these outcomes were related to the three factors proposed.

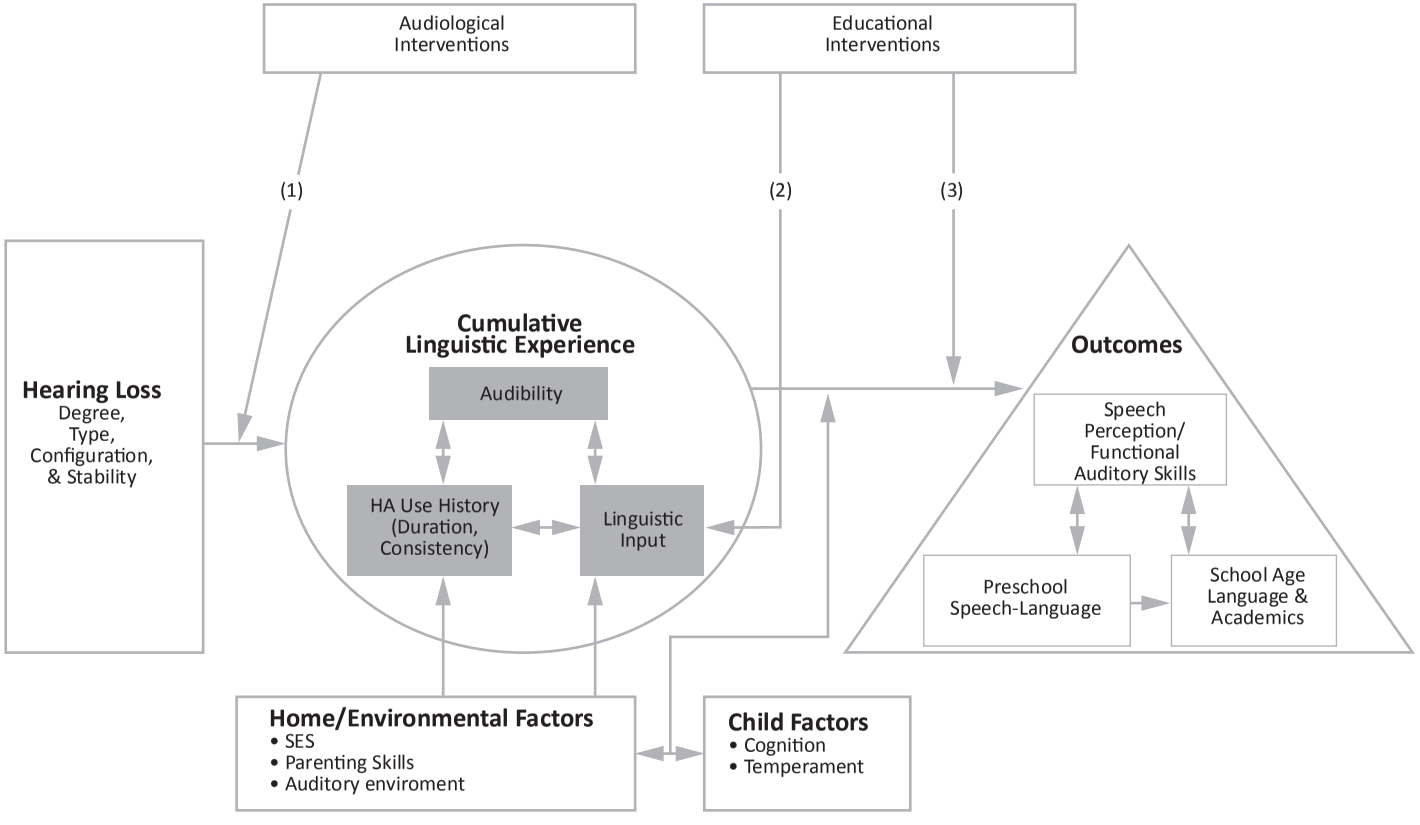


**Figure 1.** The model of inconsistent access (Moeller & Tomblin, 2015)

In considering the development of children with MHL, it is also important to take their social-emotional experiences and outcomes into account; this involves broadening the scope and relevance of Moeller et al.'s model. In the present research, therefore, we aim to expand the model to include social-emotional experiences and outcomes (see Figure 2). To acquire the social-emotional skills necessary to build and maintain meaningful interactions with other people, children need input from knowledgeable others in the early years. However, this type of input too is less accessible for children with MHL. Their hearing loss prevents them from overhearing conversations, for instance, so that they miss out on social information that others are privy to (incidental learning). Further, it is more difficult for them to join in interactions among peers when there is background noise, in environments such as daycare or playgrounds (Rieffe et al., 2017). However, children need opportunities to engage in these social interactions to learn about the emotions, intentions, and perspectives of others.


**Figure 2.** Reduced cumulative linguistic and social-emotional experiences.

In order to build meaningful relations with others it is essential to feel and understand the emotions of people around you. This ability, empathy, is often regarded as the social glue in relationships, because it facilitates social bonding (Hofman, 1990). The first stage of empathy, *affective empathy,* refers to feeling what the other is feeling; this stage of empathy is believed to be innate. The next stage, *cognitive empathy*, is to understand why the other is feeling that way. This capacity is stimulated by interacting with others and observing how others interact. Given their limited opportunities for incidental learning, we might expect children with MHL to have difficulties in understanding the feelings and actions of others.

Based on, and extrapolating from the model of inconsistent access, we might expect that children with MHL would experience limitations in their access to social-emotional input, which might lead to a decrease in social-emotional experiences, resulting in poorer social-emotional outcomes. Recent studies have shown that preschool children with MHL have more behavioral problems (Netten et al., 2015), problems with peers (Laugen et al., 2016), difficulties in social functioning (Netten et al., 2015), and delays in theory of mind

development (Netten et al., 2017) than their hearing peers. Further, in studies including children with MHL together with children with severe and profound HL, higher rates of psychosocial difficulties are reported among children with HL, and the outcomes were not affected by the degree of HL (e.g., Dammeyer, 2010; Kouwenberg et al., 2012; Leigh et al., 2015; Netten et al., 2016; Stevenson et al., 2010; Theunissen et al., 2014; Wong et al., 2017). Since most studies focused on the preschool or school age group, it is not clear whether these difficulties already emerge at a younger age.

**Audiological interventions**

The first few years of a child's life are critical for language development (Kuhl, 2010), so early auditory stimulation is very important. Audiological interventions such as the amplification of hearing aids have the potential to reduce the risks for impaired language development (Figure 3). Well-fitted hearing aids provide children with better audibility, and greater audibility allows for more linguistic experiences, which in turn is related to better language outcomes (McCreery et al., 2015).

Early hearing aid fitting (before six months) has been shown to be related to better speech and language outcomes in comparison with later fitting (Ambrose et al., 2014; Sininger, Grimes & Christensen, 2010; Tomblin et al., 2015). Also, children with more consistent daily hearing aid use have better language outcomes than children with less consistent use (Walker et al., 2015).

Not all children use their hearing aids consistently, and not all devices are fitted optimally, which means that children with MHL still have inconsistent access to sounds and speech.

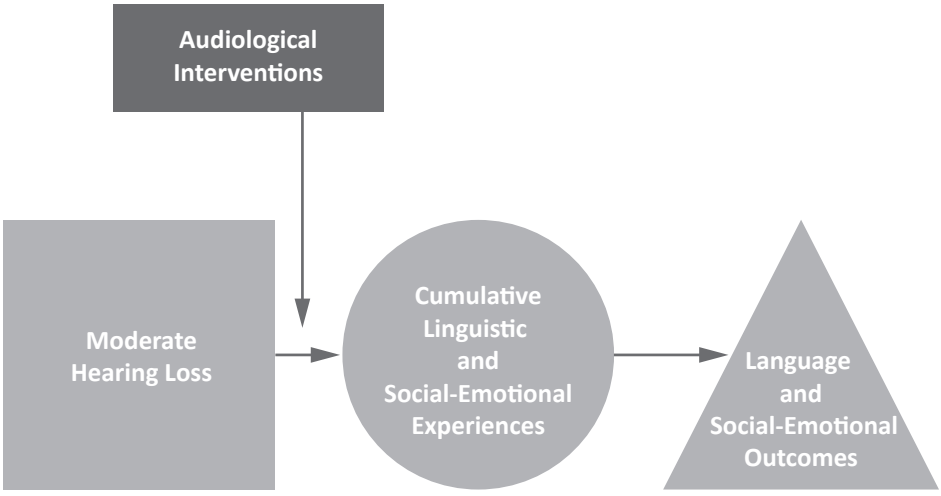


**Figure 3.** Audiological interventions: access to linguistic and social-emotional input

Moreover, in noisy environments it is difficult for these children to pick up all speech clearly even if they are using a hearing aid (Finitzo-Hieber & Tillman 1978; McCreery & Walker, 2017; Stelmachowic et al., 2004). This inconsistent access results in a reduced potential for linguistic uptake, which in turn increases the risk of children with MHL missing out on opportunities to learn language. Further, this inconsistent access to acoustic cues will also reduce opportunities for social-emotional learning.

**The caregiving environment**

In the early years of child development the caregiving environment is an important context in which learning takes place. Children acquire their knowledge and skills by interacting with family members and other caregivers. In later interactions with peers at school, in the neighborhood, or at sport clubs, children will benefit from these skills they acquired in early childhood. According to the social-ecological model, children's development is affected by their social relationships and the world around them (Bronfenbenner, 1979).

In the model of inconsistent access home and environmental factors such as socio-economic status and parenting skills are believed to contribute to the linguistic and social-emotional experiences of children with HL (see Figure 4). Family's socio-economic status and parental educational levels have been related to a range of developmental concerns in children (e.g. Bornstein & Bradley, 2014; Hart & Risley, 1995). Children with HL who were raised in lower-income families had lower language abilities than children raised in high-income families (Ching & Dillon, 2013). Children whose mothers had higher levels of education used their hearing aids more hours a day than children whose mothers had lower levels of education (Walker et al., 2015).

Parents[1] play a crucial role in the development of their children. In the early years, when brain neuroplasticity is the greatest (Sharma, Campell & Cardon, 2015), children spend most of their time with their parents. Therefore, brain neural development may be particularly sensitive to caregiving influences during this period. Research has shown that early parent-child interactions are associated with children's language and social-emotional outcomes (Dunn, Brown & Slomkowski, 1991; Fay-Stammbach, Hawes & Meredith, 2016; Kok, Lucassen & Bakermans-Kranenburg, 2015; Moreno, Klute & Robinson, 2008; Quittner et al. 2013). For example, warm and sensitive parenting contributed to better language ability and more positive empathic child behavior (Moreno et al.).

Most children with HL have parents without HL (Mitchell & Kachmer, 2004). For these parents the HL of their child is often their first experience with HL. Parents are faced with

1 The term parents is used to refer to mothers, fathers, and other caregivers

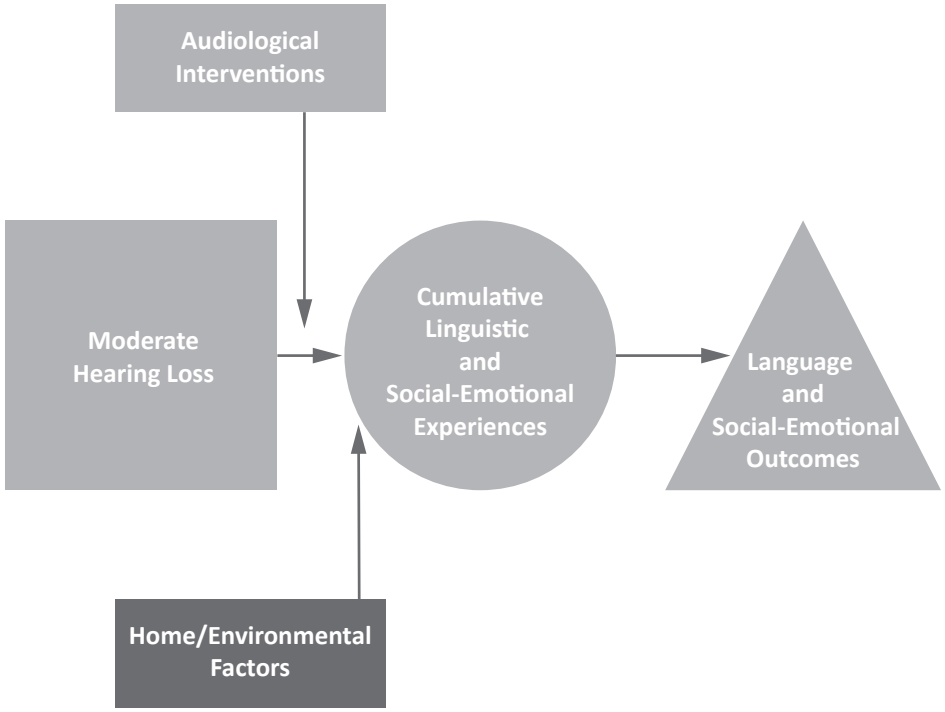


**Figure 4.** Home and environmental factors: access to linguistic and social-emotional input

challenges such as communication, hearing aids, and various changes in daily routines. These challenges and the associated concerns might result in higher rates of parental stress and less positive parent-child interactions. Various studies have reported associations between parental stress and various child factors such as language ability and social-emotional skills; however, in fact most found similar levels of parental stress in parents of children with and without HL (e.g. Calderon & Greenberg, 1999; Hintermair, 2000, 2006; Meadow-Orlans, 1994; Pipp-Siegel, Sedey & Yoshinaga-Itano, 2002; Stika et al., 2015; Topol et al., 2011). Nevertheless, it is important to note that none of these studies focused specifically on children with MHL.

In general, most parent-child-related studies in the population of children with HL included children with MHL together with children with more severe HL, or focused solely on children with profound HL. Research on the interactions between children with HL and their parents has generally shown more difficulties compared with their peers with NH: parents tended to be more directive and less flexible (see Pressman, Pipp-Siegel & Yoshinaga-Itano, 1999); episodes of joint engagement were briefer (Barker et al., 2009; Cejas et al. 2014; Lederberg & Mobley, 1990; Prezbindowski, Adamson & Lederberg, 1998); and parents were less sensitive (Quittner et al., 2013). These difficulties might impede children with HL in obtaining the linguistic and social-emotional input they need.

Moreover, the way parents talk to their children affects children's language ability and social-emotional skills. Both the amount of talk and the quality of parental talk have been related to children's language abilities (Hart & Risely, 1995; Rowe, Leech, & Cabrera, 2017). Children with MHL may have inconsistent access to parental talk, because they do not hear all speech well enough (because of not wearing a hearing aid and/or because of background noise). Further, they may have inconsistent access to high-quality talk because their parents do not use this kind of talk with them. High-quality talk such as asking open-ended questions, expansion and recasting is supposed to be language evoking (Desjardin et al., 2014).

Parents of children with MHL may adapt their own language level and provide less complex language in response to the lower language abilities of their children. One study showed that children with mild to severe HL were exposed to more directing language (low-quality talk) and less high-quality language by their parents than their peers with NH (Ambrose et al., 2015). In other studies, directing language was associated with lower language abilities, while high-quality language was associated with better language abilities (Ambrose et al.; DesJardin et al., 2014). In addition, parents of children with HL were shown to use less mental-state language (e.g. think, know, believe, remember, want) during interactions than parents of children with NH (Moeller & Schick, 2006; Morgan et al., 2014), which in turn was related to children's theory of mind development (Moeller & Schick). To conclude, the caregiving environment is one of the factors that is likely to contribute to the linguistic and social-emotional input to children with MHL.

**Family-centered early interventions**

Although the focus of their studies was on audiological interventions, Moeller and Tomblin (2015) included a key role for educational interventions in their model of inconsistent access. Because the present thesis concerns children with MHL in their early years, the focus will be on family-centered interventions (see Figure 5). FCEI programs aim to support families with a child with HL to achieve the best outcomes. Early interventionists provide parents with information about HL and support parent behaviors that promote the language and social-emotional development of children with HL.

The younger the age of children with HL when they and their parents first receive support, the better the language and social-emotional outcomes (Ching et al., 2017; Holzinger, Fellinger & Beitel, 2011; Meinzen-Derr, Wiley & Choo, 2011; Moeller, 2000; Yoshinaga-Itano et al., 1998). Children who enrolled in FCEI within the first six months of life had better language outcomes than children who enrolled after six months (Yoshinaga-Itano et al.). Further, high levels of parental involvement within FCEI programs correlated with positive language outcomes (Moeller).

We are especially interested in establishing which specific elements of FCEI – for instance, interventions that enhance parents' use of language-evoking strategies – are effective in

enhancing child outcomes. Although several studies have shown the importance of linguistic input for children's language ability, there is less evidence for specific interventions that promote parents' communication strategies.

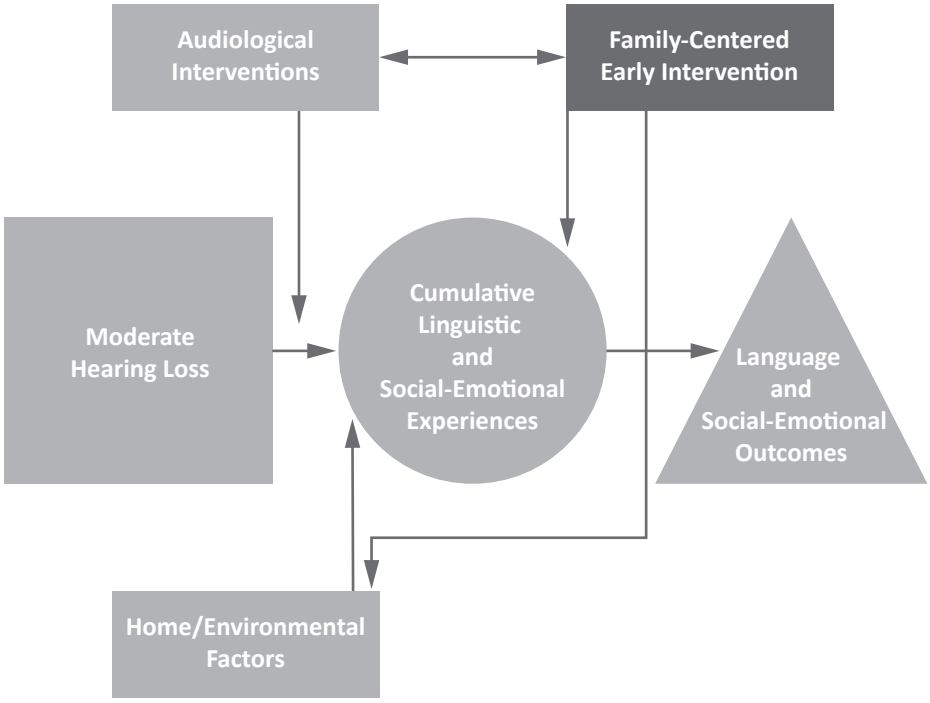


**Figure 5.** Family-centered early interventions: access to linguistic and social-emotional input

**Rationale and outline of this thesis**

Children with MHL and their families first enrolled in family-centered early intervention in the Netherlands in 2008. On the basis of the literature on children with MHL at that time, it was difficult to obtain a clear picture of their needs. Therefore, in 2009 the Dutch Foundation for the Deaf and Hard of Hearing Child (NSDSK) started a research project on the psychosocial functioning of young children with MHL and their caregiving environment. The outcomes of this project are presented in this thesis. Recently there has been more focus on this group of children, although still relatively little compared to deaf children (with or without cochlear implants). As discussed above, the few studies that have been conducted with children with MHL have shown these children to be at risk for language and social-emotional difficulties. However, most studies have focused on the preschool age, and not all participating children had benefitted from early screening and intervention. Furthermore, most studies have focused on child language outcomes. Insight into different

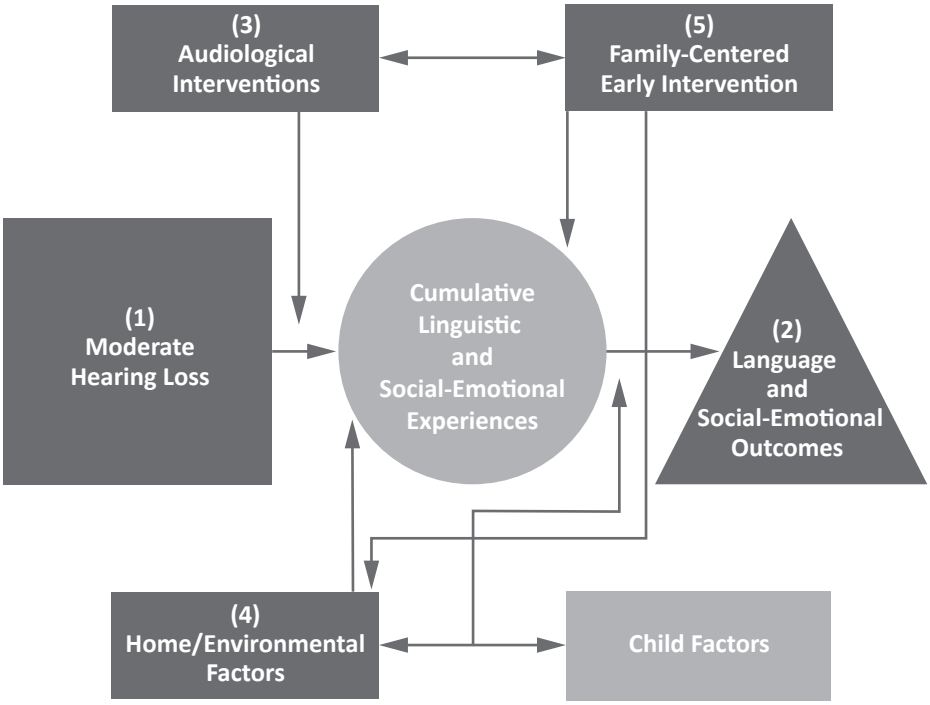


**Figure 6.** The expanded and adapted model of inconsistent access

developmental domains of young children with MHL who have been identified through newborn hearing screening and benefitted from early intervention can facilitate the identification of future challenges and opportunities for these children and their families.

In this thesis, the expanded and adapted model of inconsistent access (Figure 6) was used as a framework to examine the language and social-emotional outcomes of toddlers with MHL within the context of their caregiving environment. Further, we examined the effect of elements of FCEI on child outcomes and the caregiving environment. Child factors such as temperament, cognition, and additional disabilities may also create challenges for the caregiving environment to provide linguistic and social-emotional input. However, although these child factors play an important role in MIA, they were not taken into account in the current thesis.

Four chapters in this thesis concerned a study sample of children with MHL and NH with ages ranging from 17 to 45 months old. The children with MHL were recruited at three centers for FCEI in the Netherlands, and the children with NH via a well-baby clinic. The data were collected between 2009 and 2012. A fifth chapter concerned a study on the effect of an interactive reading program on parent behavior and was conducted in a

sample of parents with children with moderate to profound HL aged between 20 and 46 months old. These children and their parents were recruited at three centers for FCEI, and the data were collected between 2013 and 2014.

**Chapter 2** describes a study that explored the empathy levels of toddlers with MHL compared to normally hearing peers; this was assessed by means of a parent questionnaire and observation tasks. Empathy, the ability to feel, understand, and respond affectively to the emotions of others, is an important aspect of social-emotional functioning. In addition to empathy levels, the relationship between empathy and language abilities was studied.

**Chapter 3** concerns the relationship between family factors and the language ability and social-emotional functioning of young children with MHL. Specifically, the study described in this chapter examined the amount of (perceived) parental stress and social support in parents of children with MHL compared to parents of children without HL. We studied the associations between perceived parental stress and social support, children's language and social-emotional outcomes, and hearing loss-related variables.

**Chapter 4** examines parent-child interaction in toddlers with and without MHL. Observations of a free-play session of parent and child were used to examine the levels of emotional availability and joint engagement in the interactions. In addition, these parent-child interaction measures were studied in relation to children's language abilities.

**Chapter 5** describes a study in which the quantity and quality of parental linguistic input to toddlers with MHL was compared to that of their hearing peers. In addition, we examined the associations between the amount and quality of linguistic input, children's language abilities, and hearing-loss-related variables.

**Chapter 6** concerns a study examining the effects of an interactive reading program for parents of toddlers with HL. We examined changes in parents' interactive reading behavior before and after the program and compared this behavior with that of parents who did not participate in the program.

**Chapter 7** presents a summary of the main findings of this project. The outcomes of the previous chapters are then integrated and their implications are discussed. The thesis concludes with clinical implications and suggestions for future research.

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CHAPTER 2

# Concern for Others: A Study on Empathy in Toddlers with Moderate Hearing Loss

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## ABSTRACT

**Objectives**
The purpose of this study was to examine empathy levels in toddlers with moderate hearing loss (MHL) compared to toddlers without hearing loss (NH), and to explore the relation between language ability and empathy.

**Design**
A total of 23 toddlers with MHL and 21 toddlers without hearing loss participated in the study. Parent report (ITSEA) and observation measures were used to rate the toddlers' levels of empathy. Both the ability to feel the emotions of others and the ability to understand the intentions of others were observed.

**Results**
The results showed that the toddlers with MHL and with NH were similar affected by the feelings of others, however, they the toddlers with MHL lagged behind their peers with NH in their understanding of others intentions. Language ability was unrelated to empathy levels in both groups of toddlers.

**Conclusions**
Toddlers with MHL seem to be at risk for problems in their empathy development. Although they are aware of the emotions of others, the development of more complex skills needed for an adequate empathic response is delayed in comparison with their hearing peers.

## INTRODUCTION

Understanding and feeling what another is feeling, how do children achieve this capacity? This skill, known as empathy, is crucial for bonding with others, and for building close and meaningful relationships (Jolliffe & Farrington, 2006). The absence of an empathic reaction when a child's best friend is in distress can seriously harm their friendship. The question is whether all children develop this skill to their full potential. A group of children that is more at risk for social-emotional difficulties are children with hearing loss (HL) (Stevenson et al., 2015). The few studies among children with HL that have been conducted to date do not show that these children have difficulties in being affected by emotional arousal in another person (Ketelaar, Rieffe, Wiefferink, & Frijns, 2013; Netten et al., 2015). However, a recent study supports the notion that within the domain of HL, the degree of hearing loss can have a differential effect on children's social and emotional development (Theunissen et al., 2015). Children with a lesser degree of HL performed less well on indices of social functioning than their peers with more severe degrees of hearing loss (Hintermair, 2007; Theunissen et al., 2015). Possibly, this also extends to empathic functioning.

To date, research regarding empathy in a well-defined group of young children with moderate hearing loss (MHL) is lacking. Therefore, the main aim of the present study was to explore the level of empathy in young children with MHL (here defined as a hearing loss between 40-70 dB in the better ear) as compared to their peers with NH.

**Children with Moderate Hearing Loss: The 'Forgotten' Children?**

To date, most research concerning children with HL has focused on children with severe and profound HL (>70 dB HL), or on children with differing degrees of HL (30 – 110 dB HL). Consequently, a gap exists in our knowledge regarding the development of children with MHL (Eisenberg, 2007), which explains why Julia Davis called these children 'our forgotten children'. There are a number of recent studies on the current generation of children with MHL, which consistently show that these children are at risk for language delays despite early intervention and use of hearing aids (Ambrose et al., 2014; Koehlinger, Van Horne, & Moeller, 2013; McCreery et al., 2015; Tomblin et al., 2015).

Studies on the social-emotional development of early-identified children with MHL are even more sparse and the results of these studies are mixed. One recent study found no difficulties in social-emotional functioning, as reported by parents, in 18-month-old children with mild to severe HL (Stika et al., 2015). In contrast, studies among older children (older than 4 years of age) with differing degrees of HL (including MHL), conducted before the implementation of the neonatal hearing screening programs showed that these children had more social-emotional difficulties than children without HL (NH) (Dammeyer, 2010; Davis, Elfenbein, Schum, & Bentler, 1986; Hintermair, 2006; Kouwenberg, Rieffe, Theunissen, & de Rooij, 2012; Theunissen et al., 2015). Theunissen

et al. (2015) even found that preadolescents with less severe degrees of HL had higher levels of psychopathological symptoms than their peers with more severe degrees of HL.

There are several possible explanations for the reported disadvantage in children with MHL relative to children with more severe degrees of HL. Some researchers have suggested that the social needs of children with MHL are often underestimated (Mary Pat Moeller, 2007; Pipp-Siegel, Sedey, & Yoshinaga-Itano, 2002). Compared to deaf children, children with MHL speak quite well and are more reactive to sound. However, it is quite difficult for children with MHL to fully understand spoken conversations between others (Stelmachowicz, Pittman, Hoover, & Lewis, 2001). Despite their hearing aids, children with MHL still have difficulties understanding speech in noise (McCreery et al., 2015; Stelmachowicz, Pittman, Hoover, Lewis, & Moeller, 2004). These difficulties in fully understanding what others are saying may frustrate children with MHL, which in turn could restrict them in their daily social interactions. For example, it will be more difficult for children with MHL to join free play situations in noisy environments. They cannot overhear all conversations occurring around them and consequently will miss information that others are privy to. They are more likely to miss how other children argue and make up with each other. Being able to fully understand and experience these social situations is beneficial for children's social-emotional development.

Language is needed to make other people's motives, feelings and perspectives accessible, which helps to understand why they behave in a certain way and makes it easier to anticipate or appropriately respond to these behaviors. Although the developmental perspectives of children with MHL have improved with the implementation of the neonatal hearing screening and early intervention programs, these children are still at risk for language difficulties (Tomblin et al., 2015) that might restrict them in their interactions with others. Their language outcomes depend on various variables like the degree of hearing loss, early age of hearing aid fitting, the consistently daily use of hearing aids, and rich maternal language input (Moeller et al., 2015). When all of these factors are optimized, children with MHL could achieve language ability scores in the average range.

In addition, parents and professionals may not be fully aware of the impact that the MHL has on the child's functioning and development. Parents might be less aware that children with MHL miss important opportunities for incidental social-emotional learning. This possible lack of awareness may mean that parents of children with MHL do not explicitly pay attention to feelings and thoughts (of self and others) when interacting with their child. In sum, children with MHL probably have fewer opportunities for social learning than children with NH and their social environment may underestimate this disadvantage, both of which can seriously affect the social-emotional development of children with MHL (Rieffe, Netten, Broekhof, & Veiga, 2015).

**Affective Empathy**

Empathy is an emotion that is triggered by observing an emotion in someone else. The capacity to experience and express empathy is an important factor in the development of social competence (Rieffe & Camodeca, 2016; Roth-Hanania, Davidov, & Zahn-Waxler, 2011). Children who show higher levels of empathy are more liked by their peers and are seen as more socially competent (Eisenberg, Spinrad, & Sadovsky, 2006). According to Hoffman's theory of empathy development, human beings are biologically hardwired to feel the distress of others (Hoffman, 1990). For example, the crying of a baby also triggers other babies to cry. Emotional reactions in response to other people's emotions - feeling what the other person is feeling - are referred to as 'affective empathy' (Baron-Cohen & Wheelwright, 2004). This feeling of others' emotions triggers prosocial behavior, for example helping or comforting the other person.

Two recent studies examined affective empathic behavior in children with HL, using a set of observation tasks and questionnaires (Ketelaar et al., 2013; Netten et al., 2015). In both studies, children were faced with "live" emotions of the experimenters. The experimenters acted out emotions in three different situations and they observed the children's reaction to these emotions. They observed to what extent the children had attention for the situation and/or the experimenter and if they showed prosocial responses to the experimenter. The situations in which the experimenter acted out the emotions differed by age of the children. With younger children, the experimenter for example hurt her finger and acted out being sad. In an older age group, the experimenter acted out that she was disappointed because her friend had cancelled an appointment. Although one study focused on young deaf children with a cochlear implant (CI) (Ketelaar et al., 2013), and the other study on preadolescents with different degrees of HL (Netten et al., 2015), both studies found similar levels of affective empathy in children with and without HL.

The question is to what extent these outcomes might also apply to children with MHL, the focus of the current study. Given Hoffman's (1990) presumption that the capacity for affective empathy is innate, there is no obvious reason to assume that children with MHL will differ from their peers with NH or from their peers with more severe forms of HL.

**Cognitive Empathy**

Next to the ability to feel what the other person is feeling, it is important to understand why a person is feeling that way. Understanding the reason behind your best friend's anger is a great help when you want to support him or her. It facilitates selection of the most suitable response from a variety of possible reactions. The ability to take the perspective of the other person - knowing and understanding what the other person is feeling - is called 'cognitive empathy', (Baron-Cohen & Wheelwright, 2004).

Recent studies on cognitive empathy have revealed that throughout childhood, children with HL lag behind their peers with NH in this respect (Netten et al., 2015; Peterson, 2015).

In the study by Peterson (2015), teachers reported that deaf children were less capable of understanding the feelings of others than children with NH. Netten et al. (2015) showed that preadolescents with different degrees of HL reported lower levels of cognitive empathy than their peers with NH.

For the development of cognitive empathy, a Theory of Mind (ToM) is essential. ToM refers to the ability to understand that others have mental states (intentions, desires, and beliefs) that may differ from one's own. ToM capacities develop during the preschool years. Various studies have shown that the development of ToM is delayed in deaf children with hearing parents (Ketelaar, Rieffe, Wiefferink & Frijns, 2012; Moeller & Schick, 2006; Peterson & Siegal, 1995, 2000; Peterson, Wellman, & Liu, 2005). However, the development of ToM in deaf children with deaf parents seems to be on par with hearing peers (Peterson & Siegal, 1999; Peterson, Wellman, & Liu, 2005; Schick, Villiers, Villiers, & Hoffmeister, 2007). Most studies used false-belief understanding to examine deaf children's ToM. In a study by Moeller (2013), false belief understanding was examined in children with MHL. In this study, only 36% of five-year-olds with MHL passed a false belief task, compared to 84% of the hearing children. So besides deaf children, children with MHL also show a delay in their ToM development.

Before the age of five, children's ToM development is marked by the so-called precursors. One of these precursors is the ability to appreciate other people's intentions (Tomasello, Carpenter, Call, Behne, & Moll, 2005). Children who are able to acknowledge others' intentions are increasingly able to understand that people's actions are guided by their intentions. Ketelaar and colleagues (2012) examined intention understanding in young deaf children with CI and hearing peers by presenting them with three tasks, which all involved a final goal that the experimenter failed to achieve. Children had to accomplish the goal in order to show they had understood the experimenter's intention. The outcomes showed that children with CI and children with NH performed equally well in finishing the action that was intended but not completed by the experimenter.

Joint attention, or the ability to share attention with a social partner for an object or event, is one of the first types of intention understanding to be observed in young infants (Tomasello, Carpenter, Call, Behne, & Moll, 2005). Within the joint attention framework, we can distinguish between imperative and declarative joint attention (Colonessi, Rieffe, Koops, & Perucchini et al., 2008). Imperative joint attention refers to the ability to understand that another person attracts one's attention to request for an object, whereas declarative joint attention refers to the ability to understand that another person attracts one's attention to share an experience and communicate about it. Young deaf children with hearing parents consistently show lower levels of joint attention than hearing peers (Cejas, Barker, Quittner, & Niparko, 2014; Prezbindowski, Adamson, & Lederberg, 1998; Tasker, Nowakowski, & Schmidt, 2010), with the exception of deaf children with CI (Ketelaar et al., 2012; Tasker, Nowakowski, & Schmidt, 2010) and deaf children with deaf

parents (Spencer et al., 2000; Gale & Schick, 2009). Peterson and Siegal (1995, 2000) have suggested that the lack of access to conversations causes delays in the development of ToM. When deaf children have sufficient access to conversations, for example as a result of receiving a cochlear implant or because they grew up with deaf parents who are used to visual communication, their ToM development might not be affected.

Taken together, these outcomes suggest that young children with CI with hearing parents do not seem to differ from their peers with NH in the precursors of ToM, whilst young deaf children without CI with hearing parents lag behind their peers with NH. This difference in outcomes within the group of children with HL might be explained by the auditory input enabled by the CI. Possibly, this early auditory input strengthens the early social-emotional development of deaf children.

**Present Study**

Empathy is an important aspect of social-emotional development as it helps children to bond and build meaningful relationships with others. It is important to study the development of empathy at the youngest possible age, especially in children with an increased risk for developing problems in their social-emotional functioning, such as children with MHL. These children's abilities are often overestimated by their social environment, resulting in an underestimation of their need for extra support and care.

The aim of the current study was to explore affective empathy and the precursors of cognitive empathy in young children (between 29 and 32 months old) with MHL as compared to a group of children of the same age with NH. To our knowledge, empathic behavior in young children with MHL has not yet received any attention in the literature. We used parent questionnaires and structured observations to measure children's level of empathy. Previous studies on affective empathy and precursors of cognitive empathy (intention understanding) in young children with CI showed that they did not differ from hearing children (Ketelaar et al., 2012, 2013; Tasker et al., 2010). Given that this is not examined in the MHL population yet, we explored whether children with MHL performed comparable to hearing peers on affective empathy and intention understanding just like young children with CI.

In addition, the relations between affective empathic behavior and intention understanding with language ability were examined. Language is assumed to be an important medium for social-emotional learning, and the social-emotional difficulties seen in children with HL (Stevenson, 2015) might stem from the fact that they often miss parts of spoken conversations. Previous studies among children with CI found no relation between affective and cognitive empathy on the one hand and language ability on the other (Ketelaar et al., 2012, 2013). In the presented study we examined whether these findings would be similar in children with MHL.

## METHOD

**Participants**

In total, 44 children between 29 and 32 months of age participated in this study. In the Netherlands, after detection of (moderate) hearing loss, children and their families are referred to a center for early intervention. The family-centered early intervention program offered here entails frequent house visits of early interventionists and speech and language therapists. Furthermore, parents are invited to follow various courses (e.g., sign courses, communication courses, and interactive reading courses) at the center together with other parents. Although parents are not obligated to participate in (parts of) the program, most parents are willing to participate. From the age of one and a half until the age of four years, children can participate in specialized treatment groups for children with HL twice a week. In these treatment groups, their language and social-emotional development is stimulated during (play) activities with other children with HL. The group activities are guided by one speech and language therapist and two pedagogical professionals (in most groups one of them is deaf or hard of hearing). Furthermore, the speech and language therapist conducts individual speech and language therapy sessions with the children during group time.

Since most children with MHL participate in family-centered early intervention programs we recruited participants at these centers. Twenty-three children with MHL were recruited via three different early intervention centers across the Netherlands. The control group of 21 children with NH was recruited via a well-baby clinic. Children with additional medical or developmental disabilities, such as intellectual disabilities, visual impairment, or speech-motor problems were excluded from the study. Although the sample was not matched one by one, no differences between the two groups were found regarding age, gender, and socioeconomic status (based on maternal education level) (Table 1).

All hearing children were born to hearing parents. Within the MHL sample, eight children had one parent with hearing loss (two mothers, six fathers). Seven of these parents were hard of hearing and one father was deaf. The children used spoken language in the interaction with their parents (seven parents and children supported their spoken language always or often with signs, thirteen sometimes and three never). All children with MHL were diagnosed with congenital moderate hearing losses (40-70 dB) in the better ear (residual hearing was calculated by averaging unaided hearing thresholds at 500, 1,000 and 2,000 Hz). They all wore conventional (bilateral) hearing aids and all but one child participated in an early family intervention program. A total of 72% of the children with MHL had enrolled in the early intervention program within the first six months of life. Further, 67% of the children with MHL had their first hearing aid amplification within the first six months of life.

**Table 1.** Demographic Profile of Participants

| | MHL | NH |
|---|---|---|
| No. of children | 23 | 21 |
| Age, mean (SD) months | 30.2 (0.9) | 30.1 (0.5) |
| Age, range months | 29-32 | 29-31 |
| Gender, no. (%) | | |
| Male | 7 (33%) | 9 (41%) |
| Female | 16 (67%) | 13 (60%) |
| Socioeconomic status, mean (SD)[a] | 2.8 (1.0) | 3.1 (1.0) |
| Receptive language, mean (SD)* | 96.05 (15.6) | 114.4 (8.4) |
| Expressive language, mean (SD)* | 93.70 (17.0) | 111.1 (10.1) |
| Degree of hearing loss (dB), mean (SD) | 52.6 (8.2) | |
| No. of children with 40-60 dB HL | 21 | |
| No. of children with 61-70 dB HL | 2 | |
| Age at start family intervention, mean (SD) months | 8.3 (7.9) | |
| Age at start family intervention, range months | 1-24 | |
| Age at amplification hearing aid, mean (SD) months | 8.3 (8.3) | |
| Age at amplification hearing aid, range months | 1-33 | |

Abbreviations: MHL Moderate Hearing Loss, NH no Hearing Loss, SD Standard deviation.
[a] (1=no/primary education, 2 = lower general secondary education, 3= higher general education, 4 = college / university).
*$p$ <.001

## Measures

### *Affective empathy observation*

The Empathy Task examines children's empathic responses to emotional displays which are acted out by an experimenter (Rieffe, Ketelaar, & Wiefferink, 2010). Children watched three different emotion episodes: happiness when clicking with a pen, anger with a pen that fails to write, and pain/sadness upon hurting one's finger. Children's reactions were scored on a 20-item checklist (0 = *not at all*, 1 = *a little*, and 2 = *a lot*) for the three emotions combined (Table 2). The internal consistency was good in the present study (α=.80) and in a recent study among a sample of young children with CI (α=.85) (Ketelaar et al., 2013).

### *Empathy parent report*

The subscale Empathy (7 items) of the Dutch version of the Infant-Toddler Social and Emotional Assessment (ITSEA) (Carter & Briggs-Gowan, 1993; Visser, Smeekens, Riksen-Walraven, & Van Bakel, 2000) was used as a parent report measure of empathy. Examples of items are "Is aware of other people's feelings" and "Is worried or upset when someone is hurt". Items were rated on a three-point scale (0 = *not true/rarely*, 1 = *somewhat true/sometimes*, and 2 = *very true/often)*. The internal consistency of the empathy subscale was good in the current study (α=.82).

**Table 2.** Items of the Empathy observation task (Ketelaar et al.,2013)[1]

| | |
|---|---|
| 1 | Child responds to experimenter's emotion |
| 2 | Child stops playing and looks at experimenter |
| 3 | Child tries to follow what is happening |
| 4 | Child mimics experimenter's facial expression |
| 5 | Child re-enacts/imitates event |
| 6 | Child physically approaches experimenter[2] |
| 7 | Child tries to comfort experimenter[3] |
| 8 | Child tries to help experimenter |

[1] Items were scored during each of the emotion episodes (happiness, anger, pain/sadness), except for item 7 and 8. [2] Assessed during pain/sadness event only. [3] Assessed during anger event only.

***Intention observation***

The Intention-Understanding Task (Ketelaar et al., 2012) assesses children's understanding of other people's intentions with regard to objects. Children were presented with three tasks, which all involved a final goal that the experimenter failed to achieve. For example, putting a string of beads into a cup. After three failed attempts by the experimenter, the materials were handed to the children, who could earn a maximum of three points if they completed the intended actions.

In the Imperative-Comprehension Task (Ketelaar et al., 2012), the experimenter points toward an object on the table - closer to the child than to the experimenter - and holds out her hand. Children received a score for success when they handed the object or placed it near the experimenter, or when they explicitly refused to do so. The task was administered three times, or until the children passed. Children received three points if they succeeded the first time, two points for the second time, one point for the third time and zero points when they failed all times.

In the Declarative-Comprehension Task (Ketelaar et al., 2012), the experimenter looks in surprise to a stimulus behind the child, points there simultaneously, looks at the child, and looks and points again behind the child. Children could earn three points, one for each of the following behaviors: (a) looking at the object, (b) eye contact with the experimenter after looking, and (c) smiling or vocalizing about the object.

***Spoken language***

Both receptive language ability and language (sentence) production were used as an indication of children's language development. Receptive language development was assessed with the Reynell Developmental Language Scales - Dutch Version (Schaerlaekens, Zink, & Van Ommeslaeghe, 1993). The sentence development scale of the Schlichting Expressive Language Test (Schlichting, van Eldik, & Lutje Spelberg, 1995) was used to measure expressive language skills. Both language tests are developed and standardized

for children between two and five years of age and have been widely used for children with and without HL. Raw scores are converted to age equivalents and language quotients. The quotient scores are normally distributed scores, with a mean score of 100 and a standard deviation of 15. These tests are part of the assessment protocol of children with MHL within the intervention programs of organizations in the Netherlands that participated in this study. The receptive language scores of two children (1 MHL and 1 NH) and the expressive language scores of four children (3 MHL and 1 NH) were missing.

**Procedure**

All children were tested individually in a quiet room at home, except for two children with MHL who were tested at the early intervention center. Two trained experimenters administered the empathy observation and intention observation tasks. The tasks were alternated with other tasks (not presented in this manuscript). Parents were asked to fill in questionnaires about their children's social-emotional functioning and their family's background. Additional information, such as degree of hearing loss and age at amplification was obtained from medical records. Speech and language therapists assessed the language ability of the children with MHL at 30 months of age as part of the assessment protocol of the early intervention program. The experimenters assessed the language abilities of the hearing children. The study was carried out in accordance with the standards set by the Declaration of Helsinki and informed consent was obtained for all children.

**Statistical Analysis**

The first research question was addressed by carrying out independent sample *t*-tests in order to compare children with MHL to hearing children on the empathy measures. Holm's sequential Bonferroni method was used to control for Type I error at the .05 level across comparisons. Effect size was estimated with Cohen's *d.* A Multivariate Analysis of Variance (MANOVA) was used to compare the levels of intention understanding between the groups, taking into account the within-subject factors. Effect size was estimated with eta squared. In case of differences between groups or tasks, post hoc t-tests were conducted. The assumptions for parametric testing were checked due to the small sample size. When the assumptions were violated, non-parametric analyses were conducted. For only one variable (intention understanding) the assumptions were not met. Yet, the outcomes of the parametric and nonparametric analyses did not show differences. For reasons of clarity, we decided to report the outcomes of the MANOVA, in line with the other variables. Correlations between the empathy measures, indices for intention understanding, degree of hearing loss and language ability were calculated using Pearson's correlations. The strength of the correlations was compared between the two groups using Fisher's r-to-z transformations and testing the z-values.

## RESULTS

**Language Ability**

The children differed in their language ability. Children with MHL had lower receptive and expressive language abilities than the children with NH, $t(40) = -4.55$, p <.001, $d = .23$ and $t(38) = -3.92$, $p < .001$, $d = 1.244$, respectively (see Table 1).

**Affective Empathy Observation and Parent Report**

The results in Table 3 show that parents of children with and without MHL rated their children equally high on the empathy parent report measure. The observation measures also revealed no differences in levels of affective empathy between both groups.

**Intention Observation**

A 2 (Group: MHL, NH) x 3 (Task: Intention Understanding, Imperative Comprehension, Declarative Comprehension) MANOVA showed a main effect for Group, ($F(1, 40) = 16,96$, $p < .001$, $\eta^2=.29$), and for Task ($F(2, 82) = 10.17$, $p < .001$), $\eta^2=.19$) which was qualified by a Group x Task interaction, ($F(2, 82) = 3.76$, $p = .027$, $\eta^2=.08$). Post-hoc *t*-tests showed that children with MHL scored lower on the Intention Understanding and Declarative Comprehension tasks than the children with NH, but not on the Imperative Comprehension task (Table 3). Post-hoc *t*-tests were conducted to examine the different types of child behavior (looking at the object, eye contact with the experimenter after looking, and smiling or vocalizing about the object) on the Declarative Comprehension task in more detail. The results indicated that the difference was largely attributable to the children with MHL less frequently engaging in eye contact and smiling or vocalizing about the object to the experimenter.

**Table 3.** Mean Scores on Empathy Parent Report, Empathy observation, and Intention Observation as a Function of Group by Task

| | No. of items | Range | Mean scores (SD) | | *t* | *p* | *d* |
|---|---|---|---|---|---|---|---|
| | | | MHL | NH | | | |
| | | | n = 19 | n = 17 | | | |
| Empathy parent report | 7 | 0-2 | 1.23 (0.5) | 1.41 (0.4) | -1.21 | .235 | .04 |
| **Empathy observation** | | | n = 23 | n = 21 | | | |
| Empathy observation | 20 | 0-2 | 0.82 (0.3) | 0.96 (0.2) | -1.90 | .064 | .06 |
| **Intention observation** | | | | | | | |
| Intention understanding | 3 | 0-3 | 1.65 (1.1) | 2.48 (0.6) | -3.11 | .003 | .94 |
| Imperative comprehension | 1 | 0-3 | 2.74 (0.9) | 2.81 (0.7) | -0.30 | .767 | .09 |
| Declarative understanding | 1 | 0-3 | 1.83 (0.7) | 2.70 (0.7) | -4.65 | .000 | 1.24 |

Abbreviations: MHL Moderate Hearing Loss, NH no Hearing Loss

**Parents with Hearing Loss and the Use of Signs**

Since eight parents of the children with MHL had a hearing loss themselves, this might have affected the results. Therefore, we repeated all analyses again with the exclusion of these parents. All results remained the same. Further, we also divided the children with MHL in a group with and a group without parents with HL and compared their performance. No differences were found between the children with and without a parent with HL.

Parents reported that they used spoken language in the interaction with their child, and seven parent-child dyads supported their language with signs. We examined whether the use of signs affected the results and divided the group children with MHL in a group that often used signs and a group that sometimes or never used signs. We found no differences between these two groups on the empathy measures. Interestingly, only one of the seven parent-child dyads that often used signs included a parent with HL. The other parents with HL reported that they sometimes or never used signs to support their spoken language.

**Relations Between Empathy Measures and Child Characteristics**

Pearson's correlation coefficients between the different empathy measures, language ability, and the degree of HL are presented in Table 4. We found no significant differences in the strength of the correlations between the two groups, therefore we collapsed the data of both groups. Receptive and expressive language scores were positively related to each other. No other significant correlations were found between variables.

**Table 4.** Pearson's correlation coefficients of Empathy, Intention and Language measures

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Degree of hearing loss[a] | | .00 | -.32 | -.02 | -.19 | .24 | .10 | .16 |
| 2 | Receptive language | | | .69* | .16 | .13 | .29 | -.00 | .22 |
| 3 | Expressive language | | | | .12 | .22 | .29 | -.01 | .15 |
| 4 | Empathy parent report | | | | | .13 | .07 | .14 | .24 |
| 5 | Empathy observation | | | | | | .28 | .23 | .29 |
| 6 | Intention understanding | | | | | | | -.02 | .26 |
| 7 | Imperative comprehension | | | | | | | | .18 |
| 8 | Declarative comprehension | | | | | | | | |

[a] only available for the children with MHL. * $p$ <.001

## DISCUSSION

Can we assume that toddlers with MHL care just as much about other people's feelings as their peers with NH? The main aim of the present study was to explore empathy levels in young children with and without MHL. We focused on affective empathy and the precursors of cognitive empathy. Furthermore, we examined whether these empathic abilities were associated with children's language ability.

In line with findings of research conducted among young children with CI (Ketelaar et al., 2013), young children with MHL in this study showed equal levels of affective empathy compared to peers with NH. Trained experimenters as well as parents reported that children with MHL were just as affected by seeing another person in distress as children with NH. These findings are in line with the view that affective empathy is an innate capacity (Hoffman, 1990), enabling children with MHL to feel what the other person is feeling to the same extent as hearing peers.

Turning our attention to the precursors of cognitive empathy, the picture was less clear. In contrast to research among young children with CI (Ketelaar et al., 2012), children with MHL differed from their peers with NH in some aspects of joint attention. When children were given an explicit non-verbal command in the Imperative Comprehension task (i.e., the experimenter pointed toward an object and held out her hand), joint attention was established in almost all children at the first attempt. However, when the experimenter tried to share her interest for an object in the Declarative Comprehension task, children with MHL responded differently from their peers with NH. Although children in both groups equally often turned their head in the direction of the object the experimenter was pointing at, children with NH more often followed through by turning back to the experimenter and making eye contact, vocalizing and/or smiling. When we combine the outcomes of these two joint attention tasks, it seems that both groups of children understood the pointing gesture equally well but that the children with MHL less often engaged in a communicative exchange with the experimenter.

Additionally, children with MHL less often completed the experimenter's intended actions, indicating a limited understanding of intentions compared to hearing children. This seems to be at odds with their performance on the joint attention tasks, where they understood quite well that the experimenter's hand gesture was meant to direct their attention to something. Possibly, the intentions behind the hand gestures in the joint attention tasks were of a much more explicit nature than the intentions shared during the experimenter's failed attempt to complete an action. Parents of children with HL are known to be more directive in the interaction with their child than parents of hearing children (Pressman, Pipp-Siegel, Yoshinaga-Itano, & Deas, 1999). Consequently, children with MHL might be more used to direct communication than hearing children and therefore less able to understand indirect communication.

In a recent study, Peterson (2015) recommended using direct behavioral observation of affective empathy in young deaf children. She argued that questionnaires might be limited in capturing the subjective experience of empathy in young children with HL whose ability to express their emotions verbally might be limited. Therefore, in the present study, observation measures (for affective empathy and intention understanding) in combination with a parent questionnaire were used to examine empathy as to increase the validity of the study. The observation instrument of affective empathy measured a child's response

to an unfamiliar person judged by the experimenter while the questionnaire measured children's empathic responses to other children and familiar persons as reported by the parent. Yet, both instruments revealed equal levels of empathy in children with and without MHL. Intention understanding was only reflected by measures of observation. Future studies might include a questionnaire next to observations.

Even though the children with MHL in this study had lower levels of receptive and expressive language skills than the children with NH, this did not affect their ability for empathy. In line with research among children with CI (Ketelaar et al., 2012, 2013), we found no relation between language ability and empathy measures in either group. It seems that adequate empathic responding in toddlers and preschoolers (with or without HL) does not require high levels of language proficiency. However, the demands that are placed on children's language capacities could become more prominent with age. Indeed, relationships between language and empathy (Netten et al., 2015), or between language and other aspects of social-emotional functioning (Stevenson, 2010; Theunissen et al., 2015) have been reported in studies among older children with HL.

Although children with MHL were on par with their peers with NH on the affective aspect of empathy, they were behind on some precursors of cognitive empathy. An important question that arises based on these outcomes is why children with MHL were less able than their hearing counterparts to understand the intentions of others and why they engaged less in communicative exchanges. Earlier studies indicated that deaf children with hearing parents showed lower levels of joint attention than hearing children (Cejas, Barker, Quittner, & Niparko, 2014; Prezbindowski, Adamson, & Lederberg, 1998; Tasker et al., 2010). However, no differences in joint attention were found in deaf children of deaf parents and in children with CI (Ketelaar et al., 2012; Spencer, 2000; Tasker et al., 2010). Access to visual and auditory information is important to develop the capacity for joint attention. Deaf parents use more visual-tactile attention strategies during interaction with their deaf child than hearing parents (Spencer, 2000), which might lead to longer episodes of joint attention. In addition, access to social information (e.g., during conversations) provided by deaf parents enhances deaf children's social-emotional-development (Peterson, 2015). Studies examining false belief understanding in deaf children with deaf parents showed no delay in this aspect of ToM (Peterson, Wellman, & Liu, 2005; Schick, Villiers, Villiers, & Hoffmeister, 2007).

Despite the inclusion of eight parents with HL in our MHL sample, we did not find an effect of parental hearing status. The children with MHL who had parents with HL performed comparable on joint attention measures to the children with MHL who had hearing parents. The parents with HL in our sample were hard of hearing (with the exception of one deaf parent). It might be that these parents did not grow up with visual communication strategies and the use of signs like deaf parents. Only one parent with HL reported to often use signs in the interaction with his child.

Previous studies demonstrated that deaf children with CI achieved comparable levels of joint attention as hearing children (Ketelaar et al., 2012; Tasker et al., 2010). We might expected the same outcome for the children with MHL, who have more auditory access than deaf children without CI. Yet, this was not confirmed, which raises the question why this would be different for children with MHL? Possibly, children with CI are more focused on visual cues than children with MHL. All children with CI experienced a period of severely limited or even non-existent access to sounds before implantation. During this period, they were highly dependent on visual cues in the communication and they may have continued to use this source of information after implantation. Since children with MHL hear sounds and voices, they might feel less inclined to focus on visual cues. In addition, intervention programs for children with CI in the Netherlands are much more extensive than intervention programs for children with MHL. After implantation, children with CI temporarily participate in rehabilitation programs of CI centers, in addition to the early family-centered intervention program. Possibly, parents of children with CI are more trained in attracting a child's attention and achieving joint attention in order to facilitate communication. As a consequence, intervention programs for children with CI and their parents might also have a beneficial effect on these children's social-emotional development.

Taken together, children with MHL may be more at risk for difficulties in their empathy development than hearing children. Although affective empathy seems to develop well, early signs of impairments in cognitive empathy are already observable in toddlerhood. Based on findings from studies among children with varying degrees of HL and given the growing importance of language for social-emotional development (Netten et al., 2015; Theunissen et al., 2015), we can tentatively assume that children with MHL will encounter difficulties in developing cognitive empathy as they grow up. This in turn may seriously impair their social functioning. To be able to play with peers, children need to share and understand the emotions, intentions, and beliefs of their peers (Brownell, Zerwas, & Balaram, 2002). Lower levels of empathic behavior may result in difficulties socializing with peers (Rieffe et al., 2015). Furthermore, when children with MHL are not very focused on others' behavior they might have fewer opportunities to learn from others. Social experiences, e.g. reflecting upon one's own behavior towards others, as well as evaluating others' behaviors are crucial to fully develop social competence (Rieffe & Camodeca, 2016).

**Limitations and Future Directions**

Due to a relatively small sample size, the results of our study should be interpreted with caution. We welcome other researchers to replicate this study with larger sample sizes. The strength of this study lies in the fact that it has been conducted in a well-defined group of young children with MHL within a small age range. The results emphasize the importance of more research among this group of children; with children of different ages, but also across the range of social-emotional domains. However, this study was cross-sectional in nature, preventing us from drawing conclusions about causal relations.

Future studies might adopt a longitudinal design to examine whether the performance of children with MHL on the precursor tasks indeed is predictive of later impairments in cognitive empathy. Also of interest is whether children with MHL will eventually catch up to their hearing peers or whether this gap in empathic behavior will continue to grow as children get older.

In the present study, we did not discriminate between visual and auditory cues of empathy. Both visual cues (facial emotion expression) and auditory nonverbal cues (emotional prosody) are assumed to be important in the development of empathy (Most & Michaelis, 2012). Children with MHL between four and six years of age do not seem to have difficulties in the auditory perception of emotions compared to their hearing peers (Most & Michaelis, 2012). The researchers assumed that children with MHL have sufficient residual hearing in the low frequency range to perceive emotions in voices. Since the young children with MHL in our study performed more poorly on non-verbal empathy measures, future research with young children might take different modalities of empathy into account.

A total of seven parents in this study were hard of hearing. We do not know whether these parents had a HL from childhood or if it was a result of ageing. For future studies, it is important to take this information into account. When parents are born with HL they might have an innate understanding of how to structure communication situations and they have their own growing up experiences that might be relevant in supporting their child's social-emotional development.

The empathy observation tasks in the present study could be of interest for clinical purposes to gain more insight in the social-emotional development of children with HL in real life settings. Therefore, it is advisable to standardize these tasks for hearing children and children with HL. When data is obtained from larger samples, norm scores could be computed and provided for professionals working with these children and for diagnostic purposes.

**Conclusions and Implications**

Research among children with MHL is still very sparse. Most research in this population has concerned language outcomes, showing that these children are at risk for language difficulties (Moeller & Tomblin, 2015; Tomblin et al., 2015). The current study indicates that these children are also at risk for social-emotional difficulties. Although the young children with MHL in this study were affected by other people's emotions to the same extent as hearing children, they were less able to read other people's intentions, potentially impairing their ability to respond appropriately in social interactions.

In early intervention programs, explicit attention needs to be given to the social-emotional development of children with MHL, and in particular to parental training of various

empathy-related skills. Parents are a child's first teacher and they have the best motivation to stimulate their child's development. Parental use of mental state talk in daily conversation is one way to promote perspective-taking abilities in children with HL (Moeller & Schick, 2006; Morgan et al., 2014). Talking about emotions, cognitive processes and other people's desires and beliefs during daily routines can enhance social-emotional development. Furthermore, explicitly labeling the emotional states of others will increase a child's understanding of others' behavior.

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CHAPTER 3

# Parental Stress among Parents of Toddlers with Moderate Hearing Loss

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## ABSTRACT

**Objectives**
The purpose of this study was to examine parental stress in parents of toddlers with moderate hearing loss compared to hearing controls. Furthermore, the associations between parental stress and child- and parent-related factors such as language, social-emotional functioning and social support were examined.

**Design**
The study sample consisted of 30 toddlers with moderate hearing loss and 30 hearing children (mean age 27.4 months). The two groups were compared using the Nijmegen Parenting Stress Index (NPSI) and parent-reports to rate the amount of social support and the children's social-emotional functioning. Receptive and expressive language tests were administered to the children to examine their language ability.

**Results**
Parents of toddlers with moderate hearing loss reported comparable levels of parental stress to parents of hearing children. Individual differences in parental stress were related to child- and parent-related factors. Poorer social-emotional functioning and language ability of the child were related to higher stress levels in parents. Parents who experienced less social support reported higher stress levels.

**Conclusions**
Parents of toddlers with moderate hearing loss experience no more parental stress than parents of hearing children on average. Given parental stress was found to be related to poorer child functioning, early interventionists should be aware of signs of elevated stress levels in parents.

## INTRODUCTION

The diagnosis of hearing loss in a child can often result in parents feeling distressed, uncertain, and grieving (Kurtzer-White & Luterman, 2003). Parents are faced with a number of new challenges and stressors, such as changes in daily routines (e.g., being aware of background noise, eye contact), communication modes, and decisions about possible hearing aids. Indeed, parents of children with disabilities report more parental stress in general than parents of children without disabilities (Britner, Morog, Pianta, & Marvin, 2003; Davis & Carter, 2008). This is a concerning fact, given that parental stress has been linked to negative child functioning in typically developing children and in children with hearing loss (HL) (Baker et al., 2003; Crnic, Gaze, & Hoffman, 2005; Hintermair, 2006; Pipp-Siegel, Sedey, & Yoshinaga-Itano, 2002)

Children with moderate hearing loss (MHL; here defined as those with better-ear pure-tone averages (PTAs) of 40 -70 dB HL) speak relatively well and hear more sounds than their deaf peers (Stelmachowicz, Pittman, Hoover, Lewis, & Moeller, 2004). Despite these advantages, children with MHL show language and social-emotional difficulties, just like their deaf peers (Davis, Elfenbein, Schum, & Bentler, 1986; Koehlinger, Van Horne, & Moeller, 2013). It has been argued that the impact of hearing loss on the functioning of children with MHL is frequently underestimated (Moeller, 2007). Most research on parental stress has focused on parents with deaf children, and not on the MHL population in particular. To fill this gap, the main aim of this study was to examine the extent to which parents with a child with MHL experience parental stress compared to parents with hearing children. Further, associations between parental stress and child- and parent-related factors like language, social-emotional functioning and social support were examined.

**Children with moderate hearing loss**

Children with MHL are unlikely to have the same auditory experience as hearing children (Wolfe et al., 2011). It is hard for children with MHL to understand speech in an environment with a noisy background, such as the playground, school or day care setting (Blaiser, 2010; Crandell & Smaldino, 2000). In most cases, hearing aids help these children to improve their hearing of sounds and speech, which in turn supports the development of more intelligible speech (Ambrose et al., 2014; Stelmachowicz et al., 2004; Tomblin, Oleson, Ambrose, Walker, & Moeller, 2014; Wolfe et al., 2015). Despite these hearing aids, not all words and sounds are heard clearly, and this can negatively impact their speech and language development (Stelmachowicz, Pittman, Hoover, & Lewis, 2001). Recent studies show that the performance of many early-identified children with MHL resembles the performance of their hearing peers, or at least within one standard deviation on norm-referenced measures (Fulcher, Purcell, Baker, & Munro, 2012; Stika et al., 2015; Tomblin et al.). The results of other studies indicate that children with MHL lag behind their hearing peers in specific domains of language development (Hammer & Coene, 2016; Koehlinger et al., 2013; Moeller et al., 2010).

Children with MHL do respond to voices and sound, although inconsistently. This inconsistency is confusing for parents and may evoke parental stress (Kurtzer-White & Luterman, 2003). The fact that children with MHL can hear many sounds and speak relatively well might, counter-intuitively, be disadvantageous to the social-emotional development of children with MHL. People have higher expectations of their abilities compared to their peers with a more severe hearing loss (Moeller, 2007). Several studies have examined the effect of the degree of hearing loss on children's social-emotional functioning and found no association (Hintermair, 2007; Kouwenberg, Rieffe, Theunissen, & de Rooij, 2012; Theunissen et al., 2012; Theunissen et al., 2011; Wolters, Knoors, Cillessen, & Verhoeven, 2014). Both children with MHL and children with more severe hearing loss were found to be more at risk for developing emotional problems, peer problems, anxious/depressed symptoms, and hyperactive behavior than their hearing counterparts. These studies focused on school-aged children who did not benefit from early intervention. Similarly, Stika and colleagues (2015) examined the social-emotional functioning of 12 to 18-month-old hard of hearing children who did benefit from early intervention. Their results indicated no differences between hard of hearing children and their hearing peers in social-emotional functioning at this young age and no effect of the degree of HL on social-emotional functioning. However, Fulcher et al. (2012) reported that the degree of hearing loss had a significant effect on language development in children with HL. Their results showed that children with MHL at three, four and five years of age performed less well on speech measures than children with severe to profound HL. The researchers argued that the less frequent intervention sessions and inconsistent hearing aid use in children with MHL could attribute to the differences with children with severe and profound HL.

Taken together, the (inconsistent) findings in the literature underscore the importance of conducting more specific research on children with MHL. In the current study, the focus is on parental stress among parents of young children with MHL, since parental stress has been linked to different aspects of child development.

**Parental stress**

Stress is a state of mental or emotional strain or tension resulting from adverse or demanding circumstances (Pipp-Siegel et al., 2002). Parental stress has been defined as "the aversive psychological reaction to the demands of being a parent" (Deater-Deckard, 1998, p. 315). Both factors inherent to the child and factors inherent to the parent can evoke parental stress (Abidin, 1995). As high levels of parental stress have been linked to negative parent and child outcomes, it is desirable that parental stress should be maintained within the normal range (Baker et al., 2003; Crnic et al., 2005; Hintermair, 2006; Pipp-Siegel et al., 2002).

Over 90 percent of children with hearing loss are born to hearing parents (Mitchell & Karchmer, 2004), who have little or no experience with hearing loss. These parents may experience concerns about their child's development, educational opportunities, and ways

to communicate with them. As a result of this lack of experience and possible concerns, raising a child with HL may be more stressful than raising a hearing child (Kurtzer-White & Luterman, 2003). Could raising a child with MHL be even more stressful than raising a child with more severe HL? Because children with MHL often react to sounds and voices, parents may believe that their child has understood more than they have. Parents may also have higher expectations of children with MHL because their communicative functioning seems to be adequate. Raising a child with MHL might be quite different from parental expectations and this discrepancy can be stressful for parents.



Relatively few studies on parental stress have included children with MHL, and even then they have mostly been included as part of a larger sample of children with HL (e.g. Calderon & Greenberg, 1999; Hintermair, 2000, 2006; Meadow-Orlans, 1994; Pipp-Siegel et al., 2002; Stika et al., 2015; Topol, Girard, St Pierre, Tucker, & Vohr, 2011). Most of these studies show that parents of children with HL experience the same level of stress compared to parents of hearing children. In general, the studies found that the degree of hearing loss did not affect the outcomes. However, two studies reported an effect of the degree of hearing loss on parental stress (Hintermair, 2000; Pipp-Siegel et al., 2002). These two studies showed that parents of children with a less severe hearing loss reported more stress concerning parent-child interaction compared to parents of children with more severe hearing loss. The two studies were completed before newborn hearing screening was fully implemented. A question that follows logically is whether or not this finding holds true for early-identified children with Hl with timely access to interventions (in Pipp-Siegel et al. only 58% of the participants were identified with a HL below 12 months old and these participants may not have been children with MHL).

One of the first studies that focused on parental stress in early-identified hard of hearing children (20 to 89 dB HL) is that of Stika and colleagues (2015). In this study, the developmental outcomes of hard of hearing children aged 12 to 18 months old were investigated. They found similar levels of parental stress in 27 mothers of hard of hearing and normal hearing children. Further, the children with hearing loss showed age-appropriated language scores and were comparable to children with normal hearing on psychosocial outcome measures. It could be argued that these optimistic outcomes of hard of hearing children are the result of early identification and early start of intervention. However, Stika and colleagues mentioned that caution should be used when interpreting these findings, because differences in developmental outcomes in hard of hearing children could emerge at a later age. Research on older early-identified hard of hearing children is therefore needed. Furthermore, the range of hearing loss in the Stika study was 20 - 89 dB HL. A more restricted range like 40-70 dB HL better reflects the population of children with moderate hearing loss.

**Individual differences in parental stress**

Individual differences in parental stress, could also be related to various child- or parent-related factors besides hearing loss, such as language ability, social-emotional functioning,

and perceived amount of social support (Hintermair, 2000, 2006; Meadow-Orlans, 1994; Pipp-Siegel et al., 2002; Quittner et al., 2010; Stika et al., 2015; Topol et al., 2011). Different studies have demonstrated an association between parental stress and language delay in children with hearing loss (Pipp-Siegel et al., 2002; Quittner et al., 2010; Topol et al., 2011). Not being able to understand well what a child expresses may contribute to parents feeling stressed. Additionally, children with hearing loss have difficulties in regulating their emotions and expressing their needs and desires, leading to frustration and acting-out behavior (Stevenson et al., 2010). Several studies have shown that high parental stress levels are associated with social-emotional behavior problems in children with hearing loss (Hintermair, 2006; Quittner et al., 2010; Stika et al., 2015; Topol et al., 2011). Protective factors have also been identified in past studies. Increased social support has been found to have a positive effect on stress in families with children with hearing loss. Feeling supported by a spouse, friends, and family may help people to adjust to stressful situations (Dunst, Trivette, & Cross, 1986). Additionally, early intervention by professionals offering emotional support and practical guidance could (indirectly) buffer parental stress, due to the resulting improved language and social-emotional outcomes for children with HL (Meinzen-Derr, Wiley, & Choo, 2011; Moeller, 2000; Stika et al., 2015; Yoshinaga-Itano, 2003).

**Present study**

As early as the 1970's and early 1980's, Davis and colleagues have emphasized the need for more research on the group of children with MHL. Now, 40 years later, these children are still underrepresented in research compared to deaf children. To our knowledge, the current study is one of the first, together with Stika and colleagues' 2015 study that examines parental stress in a well-defined group of children with MHL who were identified early in life and for whom intervention was initiated soon after hearing loss was diagnosed.

The primary aim of this study was to examine the amount of perceived parental stress in parents of young children with MHL compared to parents of hearing children. Parental stress was divided in child-related stress (e.g. child's mood, hyperactivity, and acceptability) and parent-related stress, (e.g. parent depression, health, and marital relationship). A secondary aim of the current study was to explore the associations between parental stress and child- and parent-related factors, including language ability, social-emotional development and social support, in children with MHL and their hearing peers.

## METHOD

**Participants**

This study included 30 children with moderate hearing loss (MHL) and 30 hearing children (NH) between 17 and 33 months of age (mean age 27.4 months). Characteristics of the samples are reported in Table 1. The hearing children were born to hearing parents. Of the sample of children with MHL, six fathers and two mothers had a moderate hearing

**Table 1.** Demographic profile of participants

| | MHL | NH |
|---|---|---|
| No. of children | 30 | 30 |
| Age, mean (SD) months | 27.7 (5.6) | 26.5 (6.5) |
| Age, range months | 18-33 | 17-33 |
| Gender, no (%) | | |
| Male | 11 (27%) | 17 (56%) |
| Female | 19 (63%) | 13 (44%) |
| Socioeconomic status, mean (SD)*[1] | 2.8 (1.1) | 3.3 (0.9) |
| Degree of hearing loss (dB), mean (SD) | 52 (8.4) | NA |
| Degree of hearing loss, *n* (%) | | |
| Moderate (40-60 dB) | 28 (93%) | |
| Moderate-severe (60-70 dB) | 2 (7%) | |
| Age at start family intervention, mean (SD) months | 8.3 (7.5) | NA |
| Age at start family intervention, range months | 1-25 | NA |
| Age at amplification hearing aid, mean (SD) months | 9,4 (9.1) | NA |
| Age at amplification hearing aid, range months | 1-33 | NA |

Abbreviations: MHL Moderate Hearing Loss, NH Normal hearing, SD Standard deviation, NA Not Available. *[1] (1=no/primary education, 2 = lower general secondary education, 3= higher general education, 4 = college / university).



loss and one father was deaf. None of the children had more than one parent with hearing loss. Seven children did have one or more siblings with hearing loss.

The inclusion criteria for the children with MHL were having congenital moderate hearing losses (40-70 dB HL) in both ears (residual hearing was calculated by averaging unaided hearing thresholds at 500, 1,000 and 2,000 Hz). All hearing children passed neonatal hearing screening. The exclusion criteria were having any other medical or developmental disability such as mental retardation, visual impairment or speech-motor problems. All children with MHL were wearing hearing aids and received care by an audiologist. In 18 children, the amplification of their hearing aids was within six months after birth. In nine children, this occurred at a later age; for three remaining children, the exact date of amplification is unknown. All children with MHL, except one, participated in an early family intervention program, including family counseling, speech therapy and specialized playgroups. Eighteen children started the family intervention program within six months after birth; eight children started later; and the exact date of commencement of the early family intervention program is unknown for three children. Age, gender and socioeconomic status (based on maternal education level) did not differ between the groups.

**Procedure**

The study was carried out in accordance with the standards set by the Declaration of Helsinki. The children with MHL were recruited by three different counseling services all over the Netherlands. The hearing children were recruited by the Youth Health Care

organization (YHC). Parents received written information about the study and were required to sign an informed consent form. A positive response rate of 90 percent was achieved. Parents were asked to fill in questionnaires. Additional information, such as age at diagnosis, age at amplification and start intervention, was obtained from medical and/or parents' records. The language ability of the children with MHL was assessed using the assessment protocol of the early intervention program for children with MHL. Within this protocol, language ability is assessed in all children with MHL at 17 and at 30 months of age by a speech and language therapist. The language abilities of the hearing children were also assessed at 17 and at 30 months of age by a speech and language therapist. The children were tested in a quiet surrounding, in the home environment of the child. Parents of both groups of children filled in the questionnaires at the same time the child's language ability was assessed.

**Measures**

***Parental stress***

The Nijmegen Parenting Stress Index (NPSI; De Brock, Vermulst, Gerris, & Abidin, 1992), which is the Dutch version of Abidin's Parenting Stress Index (Abidin, 1983), was used to assess the level of perceived parental stress. The NPSI, a self-report measure, consists of 123 items tapping into child and parent characteristics. The Total Stress scale is comprised of a child and a parent domain. The Child Domain (child-related stress) is composed of six subscales: distractibility/hyperactivity, adaptability, positive reinforcement, demanding, mood, and acceptability. The Parent Domain (parent-related stress) consists of seven subscales: sense of competence, social-isolation, attachment, health, role restriction, depression and marital relationship. In the current study, the scores on the Child Domain and Parent Domain scale are reported. Parents rated their agreement with each item on a six point Likert scale from (0) strongly disagree to (5) strongly agree. All scores are reported as raw scores, with higher scores indicating more stress. The internal consistency of the NPSI in this study is reported in Table 2.

**Table 2.** Psychometric properties of questionnaires

| | No. of items | Range | Cronbach's Alpha |
|---|---|---|---|
| Parental Stress (NPSI) | | | |
| Parent domain | 58 | 0-5 | .92 |
| Child domain | 63 | 0-5 | .95 |
| Social-emotional functioning (ITSEA) | | | |
| Externalizing | 23 | 0-2 | .86 |
| Internalizing | 25 | 0-2 | .65 |
| Dysregulation | 34 | 0-2 | .85 |
| Competence | 34 | 0-2 | .85 |
| Social support (MPSS) | 12 | 1-6 | .88 |

***Language ability***

The language ability of children younger than 24 months of age (N = 13; MHL = 5; and NH = 8) was measured with the Dutch non-speech test (NNST; Zink & Lembrechts, 2000). The NNST is the Dutch version of the American non-speech test by Huer (1983) and contains an expressive and receptive language scale with 50 items each. The language ability of children older than 24 months of age (N = 40; MHL = 21; and NH = 19), was assessed with the Reynell Developmental Language Scales - Dutch Version (Schaerlaekens, Zink, & Van Ommeslaeghe, 1993) for receptive language skills and with the Sentence Development scale of the Schlichting Expressive Language Test (Schlichting, van Eldik, & Lutje Spelberg, 1995) for expressive language skills. Both language tests were developed and standardized for children between two and five years of age. The language scores of seven children (MLH = 4 and NH = 3) were missing.

***Social-emotional functioning***

The Infant-Toddler Social and Emotional Assessment (ITSEA; Carter et al. 2003) is a parent-report scale that assesses young children's social-emotional behavioral problems and competencies in four domains (Externalizing, Internalizing, Dysregulation, and Competencies). The Externalizing domain includes activity/impulsivity, aggression/defiance, peer aggression, and negative emotional reactivity. The Internalizing domain consists of scales that address inhibition/separation, fears, and depression/withdrawal. The Dysregulation domain includes the following scales: sleep, eating, and toileting. The Competence domain consists of attention, compliance, prosocial peer, empathy, emotional positivity, mastery motivation, and emotional awareness. Parents completed the Dutch version of the ITSEA (Visser et al., 2000). In the present study, the raw scores of the four domains are reported. Items were rated on the following 3-point likert scale: (0) Not true/rarely, (1) Somewhat true/sometimes, and (2) Very true/often. Across several studies, the ITSEA has demonstrated acceptable internal consistency, test-retest reliability, and validity relative to other parent-report checklists and independent behavioral observations (Carter et al. 2005). The internal consistency of the ITSEA in this study is reported in Table 2. The ITSEA was developed for children between 12 and 36 months of age.

***Social support***

Social support was assessed with the Multidimensional Scale of Perceived Social Support (MPSS; Zimet, Dahlem, Zimet, & Farley, 1988). The MPSS, a 12-item self-report scale, has three subscales measuring perceived social support from family (e.g., "My family really tries to help me"), friends (e.g., "I have friends with whom I can share my joys and sorrows"), and significant others (e.g., "There is a special person in life who cares about my feelings"). Parents rated their agreement with each item on a six-point Likert scale from one (strongly disagree) to six (very strongly agree). In the current study the total score was utilized. The internal consistency of the MPSS in this study is reported in Table 2. From one parent (MHL) we did not receive the questionnaire back.

**Statistical analysis**

The first research question was addressed by carrying out independent sample *t*-tests in order to compare children with MHL and hearing children on parental stress and background variables. Holm's sequential Bonferroni method was used to control for Type I error at the .05 level across comparisons. In order to answer the second research question, relations between parental stress and child's language ability, social emotional functioning and parent's social support were examined by means of Pearsons's correlations. The correlations were compared between the two groups using Fisher's r-to-z transformations to be able to show significant differences between correlations.

## RESULTS

Table 3 shows the mean scores and standard deviations for all variables that were included in this study per group. All questionnaires showed to be filled in by the mothers of the children. No significant differences were found on the levels of stress for parents with a child with MHL or a hearing child; neither on the child-related nor on the parent-related stress factors. Children's social-emotional functioning did not differ significantly between the two groups (Externalizing, Internalizing, Dysregulation and Competence). However, parents of children with MHL perceived less social support than parents of hearing children.

**Table 3.** Parental stress, social-emotional functioning, social support and language measures by group

| | Mean scores (SD) | | T | *p* |
|---|---|---|---|---|
| | MHL (n=30) | NH (n=30) | | |
| Parental Stress (NPSI) | | | | |
| Parent domain | 1.9 (0.5) | 1.8 (0.4) | 0.61 | .544 |
| Child domain | 1.9 (0.5) | 1.8 (0.5) | 0.05 | .959 |
| Social-emotional functioning (ITSEA) | | | | |
| Externalizing | 0.44 (0.3) | 0.48 (0.3) | -0.56 | .578 |
| Internalizing | 0.36 (0.1) | 0.39 (0.2) | -0.91 | .369 |
| Dysregulation | 0.39 (0.2) | 0.46 (0.3) | -1.07 | .289 |
| Competence | 1.44 (0.3) | 1.51 (0.2) | -1.21 | .230 |
| Social support (MPSS) | 5.2 (0.6) | 5.6 (0.4) | -2.78 | .007 |
| Language ability | | | | |
| | MHL (n = 5) | NH (n = 8) | | |
| NNST receptive language | 27.8 (9.8) | 34.6 (6.0) | -1.56 | .146 |
| NNST expressive language | 25.0 (12.5) | 28.5 (6.3) | -0.63 | .543 |
| | MHL (n =21) | NH (n = 19) | | |
| Reynell receptive language | 96.9 (17.5) | 110.9 (10.8) | -3.01 | .005 |
| Schlichting expressive language | 96.9 (17.2) | 110.8 (11.5) | -2.93 | .004 |

Abbreviations: MHL Moderate Hearing Loss, NH Normal hearing, SD Standard deviation,

Furthermore, the receptive and expressive language ability of the children with MHL older than 24 months of age was poorer than the receptive and expressive language ability of the hearing children. No differences in language ability between the two groups were found at younger ages. The abovementioned results remained the same when we excluded the children with a parent with hearing loss and repeated the analyses. The results also remained the same when gender was added as covariate in the analysis.



The relationships between parental stress, social support, and child characteristics were also examined (Table 3). For both parents with a child with MHL and parents with a hearing child, higher levels of child-related stress levels (e.g., adaptability, positive reinforcement, demanding, mood) were related to lower levels of social-emotional functioning (Externalizing, Internalizing, Dysregulation and Competence) and lower language ability in the children. Higher levels of parent-related stress were related to lower language ability in the younger children. Furthermore, higher levels of parent-related stress were related to more internalizing behavior problems of the children in both groups and less perceived social support. However, in the group of hearing children, higher parent-related stress levels were related to more externalizing behavior and emotional dysregulation; this relationship was not found in the group of children with MHL. The correlations between parental stress and child's social emotional functioning kept their significance after controlling for the effect of age. Within the group of children with MHL, no relationship was found between child- and parent-related stress levels and intervention (age at amplification and start of family intervention).

**Table 4.** Correlations between stress and social-emotional functioning, language, intervention, and social support

| | Parent related stress | Child related stress |
|---|---|---|
| Social-emotional functioning (ITSEA) | | |
| Externalizing | .15 /.63*** | .65*** |
| Internalizing | .46*** | .57** |
| Dysregulation | .14/.60** | .65** |
| Competence | -.21 | -.25* |
| Language ability | | |
| NNST receptive language | -.60* | -.55* |
| NNST expressive language | -.69* | -.52* |
| Reynell Receptive language | -.26 | -.35* |
| Schlichting expressive language | .01 | -.16 |
| Intervention | | |
| Age at amplification | .10 | .11 |
| Age at start family intervention | .30 | .16 |
| Social support (MPSS) | -.31* | -.14 |

Note. Correlations are provided separately for the children with moderate hearing loss and hearing children when these were found to be significantly different (using Fisher Transformation) (MHL/NH).
* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

## DISCUSSION

Raising a child with MHL can bring additional challenges and demands for parents. To date, this study is one of the first to explicitly compare children with MHL and hearing children in terms of parental stress. The outcomes of the study showed that parents of young children with MHL, who had access to early intervention reported comparable stress levels than parents of hearing children. These findings are in line with that of Stika and colleagues (2015) who found comparable stress levels in parents of hard of hearing infants and parents of hearing infants. In contrast, Pipp-Siegel et al.(2002) found that parents of children with a less severe HL reported higher stress levels than parents of children with a more severe HL. However, Pipp-Siegel et al. (2002) did not compare children with a less severe HL and hearing children directly and not all children included in the study were identified early and had access to early intervention.

Since almost a third of the children with MHL in our sample had either a parent or sibling with HL we might speculate that having experience with hearing loss could have an ameliorative effect on parental stress levels. Parents wit HL are more familiar with the effect of HL on their daily functioning and probably know better which challenges will faced when growing up with having a HL. On the other hand when we excluded the children with a parent with HL from the analyses the results remained the same. Furthermore, the mothers filled in the parental stress questionnaire and only two mothers in the sample had a HL compared to seven fathers.

The positive finding of the current study that parents of both groups reported comparable stress levels could be related to the early intervention programs which all but one of the children with MHL and their parents were involved in. Indeed, 86 percent of the children with MHL were identified within the first six months of their life, and a majority (68%) of these children began an early intervention program within these six months. This program entailed home visits from early interventionists who provided families with the necessary information and support to promote their child's auditory, language, and social-emotional development. Having more knowledge about MHL and better strategies to communicate with a child with MHL in the context of everyday activities may result in reductions in parental stress. Future studies should further explore the protective influence of early intervention programs and, more specifically, identify which factors contribute to lower parental stress.

Despite having stress levels approximately equal to parents of hearing children, parents of children with MHL did report receiving less social support. As stated in the introduction, an overestimation of the access to social environment of a child with MHL can easily occur and might also account for this finding. Children with MHL react seemingly appropriately to many sounds and words and speak relatively well. Consequently, other people may assume that children with MHL function as well as their hearing peers. Consequently,

people in the social network of parents of a child with MHL may not be aware of the challenges and difficulties that both the children and their parents face.

**Individual differences in parental stress**

Although, in the present study, the stress levels of parents of children with MHL and parents of hearing children did not differ on an absolute level, individual differences appeared in relation to other factors. Social support was an important mediator of parental stress in previous studies (Asberg, Vogel, & Bowers, 2008; Hintermair, 2000; Lederberg & Mobley, 1990; Sarant & Garrard, 2014). In line with these studies, we also found that more social support was related to less parent-related stress (i.e., parent-related factors such as social isolation, role restriction). Future research should also focus on perceived support from professionals since this study focused solely on support from close friends and family. An increase in professional support could act as a buffer for parental stress levels.



Child-related factors may also account for individual differences in parental stress levels. In line with previous results, language delays in children contributed to higher levels of parental stress (Hintermair, 2000; Pipp-Siegel et al., 2002; Quittner et al., 2010; Topol et al., 2011). In the current study, both receptive and expressive language was related to child- and parent-related stress in children younger than 24 months of age. However, amongst the children older than 24 months of age, only lower receptive language ability was associated with higher child-related stress factors. Children with lower receptive language abilities may have more difficulties understanding parental instructions, requests, and explanations, and they may therefore behave less adaptively. These difficulties in turn may negatively influence parent-child interactions, consequently evoking stress in the child.

As could be expected and in line with previous findings (Hintermair, 2006; Quittner et al., 2010; Stika et al., 2015;Topol et al., 2011), problems in children's social-emotional functioning were related to higher levels of child-related stress factors. For social-emotional functioning and parent-related stress factors we observed a different pattern. Higher levels of internalizing symptoms in children from both groups were related to higher levels of parent-related stress. In contrast, higher levels of externalizing problems and dysregulation in children were related to higher levels of parent-related stress only in parents of hearing children. Taken together, these outcomes suggest not only that child-related factors affect parental stress independently of children's hearing status, but that the pattern differs for parent-related stress factors. It is possible that externalizing behaviors are a result of parental stress, and not the cause. The present study has a cross-sectional design, but future studies examining the causal relationships between the child- and parent-related factors could shed more light on the causality of the found associations.

**Conclusions and implications**

A positive and promising outcome of this study was the comparable stress levels found in parents of children with MHL and parents of hearing children. Despite reporting lower levels of social support and lower children's language levels, parents of children with MHL did not experience higher stress levels. It is essential that future research explores in more detail how early intervention may act as a buffer for parent stress levels, in order to ensure these positive outcomes are sustained. It is also important to monitor the ways in which stress levels may change over time as children begin to develop beyond the toddler years, and how the further development of factors such as language and behavior may influence stress levels differently in families of older children.

More research on children with MHL is needed as our findings indicate a difference in language ability at the age of 30 months compared to hearing. It is interesting to find out whether this gap will close or perhaps will get larger as children get older. Other important variables that are related to child functioning, like parent-child interaction need to be investigated to get a more comprehensive picture of the group of children with MHL.

Within early family intervention programs, professionals should be aware of signs of parental stress, and the relationships between parental stress and language and social-emotional development of the child. Given that social support is an important buffer for parental stress, early intervention professionals should also pay attention to the social network of parents of children with MHL. Early intervention professionals could support parents in informing and involving important relatives in the care for their child with MHL.

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CHAPTER 4

# Are you there for me? Joint Engagement and Emotional Availability in Parent-Child Interactions for Toddlers with Moderate Hearing Loss

*Ear & Hearing (in press)*

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## ABSTRACT

**Objectives**
This study examined joint engagement and emotional availability of parent-child interactions for toddlers with moderate hearing loss (MHL) compared with toddlers with normal hearing (NH) and in relation to children's language abilities.

**Design**
The participants in this study were 25 children with MHL (40-60 dB hearing loss) and 26 children with NH (mean age 33.3 months). The children and their parents were filmed during a 10-minute free play session in their homes. The duration of joint engagement and success rate of initiations were coded next to the level of emotional availability reflected by the Emotional Availability Scales. Receptive and expressive language tests were administered to the children to examine their language ability.

**Results**
Groups differed in joint engagement: children with MHL and their parents were less successful in establishing joint engagement and had briefer episodes of joint engagement than children with NH and their parents. No differences between groups were found for emotional availability measures. Both joint engagement and emotional availability measures were positively related to children's language ability.

**Conclusions**
Children with MHL and their parents are emotional available to each other. However, they have more difficulties in establishing joint engagement with each other and have briefer episodes of joint engagement compared with children with NH and their parents. The parent-child interactions of children with better language abilities are characterized with higher levels of emotional availability and longer episodes of joint engagement. The results imply that interactions of children with MHL and their parents are an important target for family-centered early intervention programs.


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## INTRODUCTION

Early parent-child interactions have a long-term impact on children's linguistic, social-emotional, and cognitive development (Dunn et al. 1991; Quittner et al. 2013; Kok et al. 2015; Fay-Stammbach et al. 2016). Parents who are available for their children by providing warmth, positive affect, and encouragement support their children's development (Emde, 2000). This parental availability might be particularly necessary for children with hearing loss (HL), since these children are more at risk for difficulties in their language and social-emotional development than their hearing peers (Stevenson et al. 2015). Most children with HL have hearing parents who have little or no experience with HL (Mitchell & Karchmer, 2004). Consequently, the interactions between children with HL and their parents may be hampered by their parents' lack of experience with HL. When the parents and their children have a different hearing status, parents need to adapt their communication style to attain successful interactions.



Recent studies indicate that parent-child interactions of children with HL are less positive than those of hearing children (Barker et al. 2009; Quittner et al. 2013; Ambrose et al. 2015; Depowski et al. 2015). Interactions are briefer, have more conversational breakdowns and parents are less sensitive and responsive to their children's communicative acts (Barker et al.; Cejas et al., 2014; Depowski et al.; Lederberg et al., 1990; Quittner et al.). Since most of these studies are restricted to children with profound HL, it is unclear if this is also true of parent-child interactions in which the child has a moderate loss (MHL). In the present study we compared toddlers with MHL (here defined as 40-60 dB HL) with toddlers with no hearing loss (NH). We examined joint engagement and emotional availability in the parent-child interactions in relation to children's language ability.

**Parent-child interaction in children with MHL**

The "mismatch" in hearing states between hearing parents and children with HL can have a negative effect on parents' intuitive interaction skills. Hearing mothers of children with HL tend to engage in more directive and controlling interactions with their children than mothers who share the same hearing status with their children (Meadow-Orlans & Steinberg, 1993; Vaccari & Marschark, 1997; Pressman et al. 1999; Ambrose et al. 2015). Moreover, parent-child interactions between hearing parents and children with HL are briefer and more often interrupted (Lederberg & Mobley, 1990; Meadow-Orlans & Steinberg, 1993; Barker et al. 2009; Depowski et al. 2015). Several studies have reported lower levels of maternal affect, sensitivity, verbal responsiveness, and engagement in parents of children with HL, compared with parents of NH children (Macturk et al, 1993; Meadow-Orlans & Steinberg, 1993; Nittrouer, 2010; Quittner et al. 2013; Cejas et al. 2014). Other studies however failed to confirm differences between these two populations (Lederberg & Mobley; Pressman et al. 1998).

Most of the abovementioned studies included children with profound HL (with or without cochlear implants) or groups of children with a range of HL. A clear picture of the parent-

child interactions of children with MHL is lacking. Children with MHL have better auditory opportunities than children with profound HL, which could in turn have a positive effect on the interactions with their parents. Most children with MHL use spoken language with their parents and they wear hearing aids that can enable them to hear speech relatively well. When children with MHL are in close proximity to their parents in an acoustically friendly environment, and they are wearing their hearing aids, they are likely to have good or sufficient access to social information. However, their ability to clearly hear their parents' voices is impaired in more noisy environments, despite the use of their hearing aids (Moeller & Tomblin, 2015). Under these circumstances children with MHL have restricted access to their parents' speech, which has the potential to negatively affect the parent-child interactions. The inconsistent reactions of children with MHL to their parents' speech, dependent on the environment, may cause parents to feel insecure about their parenting role (Kurtzer-White & Luterman, 2003). These feelings of insecurity can hamper parents in interacting intuitively with their children.

Although, to the best of our knowledge, there are no studies that specifically examine parent-child interactions in dyads of parents and children with MHL, we know of three publications that focus on the quantity and quality of parental linguistic to children with mild to severe HL (25-75 dB HL) (VanDam et al., 2012; Ambrose et al. 2014; Ambrose et al. 2015). These three publications are part of the Outcomes of Children with Hearing Loss (OCHL) study – a multicenter, longitudinal project investigating the outcomes of children who are hard-of-hearing (for a description see Tomblin et al., 2015a). This is one of the first study that follow children with mild to severe HL longitudinally in their development. In two of their publications, the authors describe the use of automated vocal analysis of full-day recordings in the home environment. In particular, conversational turns between parent and child and the amount of words parents exposed their child to were examined. The recordings showed no differences on the number of conversational turns nor the amount of words parents exposed children with mild to severe HL to in comparison with NH children. The number of conversational turns was positively related to children's language abilities.

In the third publication the authors analyzed video recordings of semi-structured conversational interactions of 156 children with mild to severe HL and 59 children with NH aged approximately 18 months and/or 3 years old. The results showed no differences on the number of utterances parents exposed their children with HL to in comparison with NH children. However, parents of the children with mild to severe HL exposed their three year-old children to a less diverse vocabulary and their vocalizations were shorter. This type of more simple language exposure was related to lower language ability. In addition, longitudinal analysis of the data of 28 children with mild to severe HL in this study indicated that more directive language when the child was 18 months old was related to lower language ability at the age of three (Ambrose et al. 2015). Taken together, the results of these studies imply that parents of children with mild to severe HL expose

their children to language that is less rich than the language parents of children with NH use. Furthermore, the exposure to more different kind of words, longer utterances, and more conversational turns is related to better language abilities.

**Joint engagement**

Children benefit the most of their parents' linguistic input during moments of joint engagement. Joint engagement refers to episodes during which interest in objects or events are shared between child and social partner (e.g. parent) (Bakeman & Adamson, 1984). However, children with mild to profound HL and their parents have been found to be less successful in establishing and maintaining joint engagement episodes than children with NH and their parents (Lederberg, et al., 1990; Nowakowski et al., 2009; Nittrouer, 2010). Moreover, these children with HL frequently failed to respond to their parents' initiations (Lederberg et al.) and vice versa (Nittrouer). These difficulties in starting and maintaining joint engagement result in briefer episodes of joint engagement. Several studies confirmed that children with severe to profound HL indeed had briefer episodes of joint engagement with their (hearing) parents than their hearing peers (Barker et al., 2009; Cejas et al. 2014; Lederberg et al.; Prezbindowski et al., 1998).



Language is an important factor in the initiation and duration of joint engagement. Within the group of children with severe to profound HL those with better language abilities had longer episodes of joint engagement than their peers with lower language abilities (Cejas et al., 2014). Possibly, conversational breakdowns increase when children have lower language abilities resulting in briefer episodes of joint engagement. Briefer episodes, in turn, may limit the potential exposure to parental linguistic input. Joint engagement is therefore an important aspect of parent-child interaction that needs to be explored in children with MHL.

**Emotional availability**

A healthy parent-child interaction includes not just the mutual physical presence of parent and child, but also their emotional availability. The concept of 'emotional availability' or sometimes labeled as 'sensitivity' is used to reflect the quality of the emotional connection between parents and their children (Emde, 2000; Emde & Easterbrooks, 1985). Children signal their affective states and needs to their parents to let them know how they are feeling, to communicate that their parents are needed and appreciated, and that they enjoy interacting with them. Parents display their emotions to affirm their children's signals, reciprocate their affection, and extend social interaction (Bornstein et al. 2010). Emotional availability entails the emotional expression and understanding of both partners in the interaction, resulting in the emotional accessibility of one to the other (Biringen & Robinson, 1991). Several studies with hearing children showed that emotional availability is positively linked to children's attachment (Easterbrooks et al. 2000; Ziv et al. 2000), cognitive development (Bernier at al., 2010; Kok et al. 2013), and social-emotional development (Moreno et al. 2008). In fact, emotional availability is seen as the foundation underlying healthy development in children (Bornstein et al. 2010).

A recent study by Quittner et al. (2013) found a lower level of emotional availability in parent-child interactions between parents and 188 deaf children with a cochlear implant (CI) (five months - 8.5 years old) compared with children with NH. Moreover, maternal emotional availability was a significant predictor of language ability four years after implantation (Quittner et al. 2013). In similar vein, emotional availability at the age of two was predictive of language ability in children with mild to profound HL at the age of three, even when controlled for initial language level, maternal education, and severity of their HL (Pressman et al. 1999).

Although there are no studies on emotional availability in a well-defined group of children with MHL, some studies included a few number children with MHL (4 or 5 per study) in combination with children with more severe HL (Meadow and Steinberg, 1993; Pressman et al. 1998). The results of these studies are however inconsistent, with one study reporting lower levels of emotional availability in children with HL relative to children with NH (Meadow & Steinberg) and the other study reporting no differences between children with and without HL (Pressman et al.). Further research is needed to determine the impact of emotional availability in parent-child interactions on the (language and social-emotional) development of children with MHL.

**Present study**

In the present study joint engagement and emotional availability in parent-child interactions for children with and without MHL were investigated. The duration of joint engagement and the success rate of initiations were examined. In line with findings in children with severe and profound HL, we expected briefer periods of joint engagement and a lower success rate of initiations for toddlers with MHL and their parents compared with toddlers with NH (Lederberg & Mobley, 1990; Barker et al. 2009; Cejas et al. 2014; Prezbindowski et al., 1998).

To be emotional available as a parent, parents should be sensitive to their children's signals, follow these signals and respond to them appropriately. Children are emotional available to their parents when they respond to their initiatives with affect and pleasure and engage parents in their interactions. Of interest in the current study is exploring whether it is more difficult to achieve high levels of emotional availability in parent-child interaction when a child has MHL. In the present study, the emotional availability in the interactions of toddlers with MHL and their parents were explored and compared with those of toddlers with NH and their parents. Based on research in deaf children with CI (Quittner et al. 2013), we expected lower levels of emotional availability in the interactions of toddlers with MHL compared with toddlers with NH. Given previous studies have demonstrated a link between the duration of joint engagement, emotional availability, and language ability (Pressman, et al. 1999; Van Dam et al. 2012; Quittner et al. 2013; Ambrose et al. 2014; Ambrose et al. 2015) we also expected this relationship in toddlers with MHL.

## METHOD

### Participants

This study is part of a larger study of the psychosocial functioning of toddlers with MHL and their families (Dirks et al., 2016; Dirks et al., 2017). A total of 51 children between 29 and 45 months of age (mean age 33.3 months) participated in this study. A group of 25 children with MHL was compared to a group of 26 children with NH. Characteristics of the samples are reported in Table 1. Age, gender, and maternal education level did not differ between the groups. The children with MHL were recruited by two family-centered early intervention centers in the Netherlands. The children with NH were recruited via a well-baby clinic. The children with NH were included in the study when they had passed the neonatal hearing screening and had no known medical or developmental disabilities. Children with MHL were included in the study when they were diagnosed with congenital moderate hearing losses (40-60 dB HL) in the better ear (residual hearing was calculated by averaging unaided hearing thresholds at 500, 1,000 and 2,000 Hz) and they had no other medical or developmental disability such as mental retardation, visual impairment or speech-motor problems. A total of five children with MHL had a father with HL (one deaf father and 4 hard-of-hearing fathers) and one child had a hard-of-hearing mother. None of the children had more than one parent with hearing loss. In the NH group no parents had HL. All children with MHL wore hearing aids and received care by an audiologist. Furthermore, all children with MHL participated in a family-centered early intervention program for children with HL.



**Table 1.** Demographic profile of participants

| | MHL (n = 25) | | NH (n = 26) | |
|---|---|---|---|---|
| | Mean (SD) | Range | Mean (SD) | Range |
| Age, months | 33.1 (4.3) | 29-42 | 33.6 (5.3) | 30-45 |
| Gender, No. (%) | | | | |
| Male | 8 (32%) | | 10 (38%) | |
| Female | 17 (68%) | | 16 (62%) | |
| Maternal educational level,[1] | 3.0 (0.9) | 1-4 | 3.2 (0.9) | 2-4 |
| Degree of hearing loss (dB), | 52.4 (5.6) | 40-60 | NA | |
| Age at start family intervention in months | 8.9 (7.9) | 1-24 | NA | |
| Age at amplification hearing aid in months | 8.7 (8.4) | 1-33 | NA | |

Abbreviations: MHL Moderate Hearing Loss, NH Normal hearing, SD Standard deviation, NA Not Available
[1] (1=no/primary education, 2 = lower general secondary education, 3= higher general education, 4 = college / university).

### Procedure

Families were visited at home by one of the two members of the research team. The children and their parents engaged in a 10-minute free-play session with standardized toys. The toys were selected in order to be age-appropriate and included building blocks,

a puzzle, and a tea set. Parents were asked to play with their child the way they usually do. All interactions were videotaped. Of the MHL population, 23 mothers (one mother with HL) and two fathers (one father with MHL) participated in de the free-play session; in the NH population 25 mothers and one father participated.

Parents were asked to fill in a questionnaire about their family's background. Additional information, such as degree of hearing loss and age at amplification, was obtained from medical records. Speech and language therapists assessed the language ability of the children with MHL as part of the assessment protocol of the early intervention program. The members of the research team assessed the language abilities of the children with NH. The study was carried out in accordance with the standards set by the Declaration of Helsinki and informed consent was obtained for all children.

**Measures**

***Language ability***

Receptive language ability was assessed with the Reynell Developmental Language Scales - Dutch Version (Schaerlaekens, Zink, & Van Ommeslaeghe, 1993). Expressive language ability was assessed with the Sentence Development Scale of the Schlichting Expressive Language Test (Schlichting, van Eldik, & Lutje Spelberg, 1995). Both language tests were developed and standardized for children between two and five years of age and have been widely used for children with and without HL. Raw scores are converted to age equivalents and language standard scores. The standard scores are normally distributed scores, with a mean score of 100 and a standard deviation of 15. These tests are a standard part of the assessment protocol used in intervention programs of organizations in the Netherlands that participated in this study. The receptive language scores of three children (2 MHL and 1 NH) and the expressive language scores of five children (4 MHL and 1 NH) were missing.

***Joint engagement***

A coding procedure developed by Lederberg (1984) was used to analyze the duration of each joint engagement (in milliseconds) within the interaction. An initiative behavior came after a period of no engagement and included one or more of the following: verbal initiation, eye gaze, laughing, smiling, pointing or reaching for an object, tapping a toy or moving it into the visual field of the partner (Lederberg & Mobley 1990). This behavior was then deemed as 'successful' if the partner responded within 3 seconds from the end of the behavior (for example: responding verbally, taking an offered toy, following a verbal instruction or laughing with the initiator). The engagement finished when either the parent or child stopped responding to the other (disengaged) for a period of 5 seconds. In line with other studies on linguistic or communicative aspects of parent-child interactions in children with HL the interactions were coded for a 5-minute interval (from 1:00 to 6:00) (Ambrose et al., 2015; Cruz et al., 2013; Loots et al., 2005). The number of initiations resulting into an episode of joint engagement was count to calculate the proportion of successful initiations by both parents and children. The mean time of each joint engagement was calculated next to the total duration of joint engagement within

the 5-minute interval. The total duration of joint engagement was calculated by summing the duration of each engagement.

The first author and a research assistant coded the play sessions. Five videos of another study were scored together to practice with the coding system. Thirteen videos of the current study (20%) were scored independently to calculate the interrater reliability. Interrater reliability was assessed using a two-way mixed, absolute agreement, single-measures intraclass correlation (ICC; McGraw & Wong 1996) to assess the degree that coders agreed in their ratings of interaction duration. The resulting ICC was in the excellent range (ICC = 0. 91), indicating a high degree of agreement between the two coders.
Two children with MHL walked out off camera during the recording and therefore five continuous minutes throughout the total recording were lacking for these children. The videos of these two children were thus not suitable for this part of the parent-child interaction analysis.



***Emotional availability***
The Emotional Availability Scales (EAS), Fourth Edition (Biringen, 2008) were used to assess dyadic emotional availability. In the present study, five dimensions of the EAS were used; three of them related to parental behavior and two related to child behavior. All were rated on a 1-7 response scale. The scales are linear, with a higher score reflecting a higher quality. Numerous studies showed the EAS to have good psychometric properties (e.g., Biringen & Easterbrooks 2012; Easterbrooks, 2005).

The three parent dimensions used in the present study were *sensitivity*, *structuring*, and *non-intrusiveness*, and the two child dimensions were *responsiveness* to the parent and *involvement* of the parent. *Sensitivity* refers to the parent's ability to create a generally positive, genuine, and affective climate. A highly sensitive parent is emotionally connected to the child and is able to correctly read and respond to the child's signals. *Structuring* refers to the degree of which the parent is able to adequately support the child's learning with respect for the child's autonomy. A parent scoring high on structuring is able to guide and scaffold the child's activities without overpowering the interaction. *Non-intrusiveness* refers to the parent's tendency to follows the child's lead. A parent high on non-intrusiveness is available for the child without being intruding, interfering or overprotective. *Child Responsiveness* is reflected by the child's eagerness and willingness to respond to the parent's suggestions or demands. A highly responsive child expresses clear signs of pleasure in the interaction and reacts positively to the parent. *Child Involvement* refers to the ability of the child to engage the parent in the interaction. A child high on involvement is available to positively involve the parent in an activity or play, for example by looking, pointing or talking.

The free play sessions were coded by two raters (the first author and a child psychologist) who had completed a training program conducted by Zeynep Biringen and achieved interrater reliability with Biringen ($r > .80$). The two raters coded 20 percent of the video

sessions independently. The intra-class reliability coefficients revealed highly satisfactory levels for all scales (r = .92 - .96).

**Statistical analyses**

Independent t-tests were used to test for differences between groups in demographics, language ability and joint engagement measures. Effect size was estimated with Cohen's *d.* Holm's sequential Bonferroni method was used to control for Type 1 error at the .05 level across comparisons. Multivariate Analyses of Variance (MANOVAs) were used to test for differences between the MHL and NH samples in the emotional availability in the interaction. Effect size was estimated with partial eta square. Correlations between the measures were calculated by Pearson's Correlations. These correlations were compared between the two groups using Fisher's *r*-to-*z* transformations to be able to show significant differences between the strength of the correlations.

## RESULTS

**Language ability**

There were differences in language ability between the two groups of children. Children with MHL had poorer receptive and expressive language abilities than the NH children, $t(46) = -4.54$, $p < 0.001$, $d = 1.31$, and $t(44) = -4.32$, $p < 0.001$, $d = 1.25$ respectively (see Table 2).

**Joint engagement**

Differences between groups were found for the total duration of joint engagement, $t(47) = -2.42$, $p = 0.030$, $d = .66$, and the mean time of each episode of joint engagement $t(47) = -2.69$, $p = 0.010$, $d = .79$, with a briefer episode of joint engagement found for the MHL group (see Table 2). The success rate of both parent and child initiations differed between groups, respectively $t(45) = -2.71$, $p = 0.010$, $d = .82$, and $t(39) = -2.31$, $p = 0.027$, $d = .71$. Both parents and children within the MHL group were less successful in establishing joint engagement than the parents and children in the NH group. The results remained the same when the interactions of the two parents with HL in the MHL group were excluded from the analysis.

**Emotional availability**

A 2 (Group: MHL and NH) x 5 (Emotional availability scales) Multivariate Analysis of Variance (MANOVA) was conducted to test for differences in the quality of interaction. The MANOVA produced no main effect for group, $F(5, 45) = 0.81$, $p = 0.549$, $\eta_p^2 = .09$. The parent-child interactions of children with MHL did not differ from their hearing peers in regard to sensitivity, structuring, non-intrusiveness, responsiveness, and involvement (see Table 2). These results did not change when the interactions of the two parents with HL in the MHL group were excluded from the analyses.

**Table 2.** Emotional availability, duration of joint engagement and success rate of initiations by group

| | MHL | | | NH | | |
|---|---|---|---|---|---|---|
| | n | Mean (SD) | Range | n | Mean (SD) | Range |
| Emotional availability | | | | | | |
| Child Scales | | | | | | |
| Responsiveness | 25 | 5.5 (1.1) | 3.0-6.5 | 26 | 5.8 (0.7) | 4.0-6.5 |
| Involvement | 25 | 5.6 (1.1) | 3.0-6.5 | 26 | 5.8 (0.7) | 4.0-6.5 |
| Parent Scales | | | | | | |
| Sensitivity | 25 | 5.6 (0.9) | 3.5-7.0 | 26 | 5.7 (0.7) | 4.5-6.5 |
| Non-Intrusiveness | 25 | 5.6 (0.9) | 3.0-6.5 | 26 | 5.9 (0.5) | 5.0-6.5 |
| Structuring | 25 | 5.6 (1.1) | 3.0-7.0 | 26 | 5.9 (0.7) | 4.0-6.5 |
| Joint engagement | | | | | | |
| Total duration of JE (sec.)* | 23 | 200 (64) | 50-288 | 26 | 241 (61) | 43-300 |
| Mean duration of JE (sec.)* | 23 | 43 (31) | 7-144 | 26 | 98 (93) | 8-300 |
| Parent success rate JE* | 23 | 0.63 (.24) | 0.11-1.00 | 26 | 0.83 (.25) | 0.20-1.00 |
| Child success rate JE* | 23 | 0.82 (.28) | 0.00-1.00 | 26 | 0.97 (.11) | 0.50-1.00 |
| Language ability | | | | | | |
| Receptive language*** | 23 | 93.3 (16.6) | 55-121 | 25 | 111.6 (10.3) | 90-134 |
| Expressive language*** | 21 | 94.1 (15.9) | 65-117 | 25 | 110.9 (10.3) | 95-135 |

Abbreviations: MHL Moderate Hearing Loss, NH Normal hearing, SD Standard deviation, JE Joint Engagement
*$p < 0.05$, ***$p < 0.001$

**Table 3.** Correlations age, degree of HL, emotional availability, and duration of communicative engagement with language ability

| | Receptive language | Expressive language |
|---|---|---|
| Age | .05 | -.04 |
| Degree HL[a] | -.11 | -.31 |
| C- Responsiveness | .44** | .29* |
| C- Involvement | .39** | .32* |
| P-Sensitivity | .45*** | .29* |
| P-Non-Intrusiveness | .36* | .22 |
| P-Structuring | .47*** | .35* |
| Total duration JE (sec) | .45** | .33* |
| Mean time JE (sec) | .39** | .29 |

Abbreviation: JE Joint Engagement
[a] only available for the children with MHL. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

### Associations between parent-child interaction and child's language ability

As we found no significant differences in the strength of the correlations between the two groups, we collapsed the data of both groups. Pearson's correlation coefficients between age, degree of HL, emotional availability, and joint engagement duration with language ability are presented in Table 3. No significant associations between degree of

HL and age were found with language ability. All emotional availability subscales were positively related to children's receptive and expressive language ability with the exception of non-intrusiveness that was unrelated to expressive language. Total and mean duration of joint engagement were related to receptive language ability. Further, total duration of joint engagement was also related to expressive language ability. In figure 1 and 2 the relation between total duration of joint engagement and language ability is presented. Furthermore, the emotional availability subscales were positively related to the total duration of joint engagement duration (Table 4) and the subscales structuring and non-intrusiveness were positively related to mean duration of joint engagement.

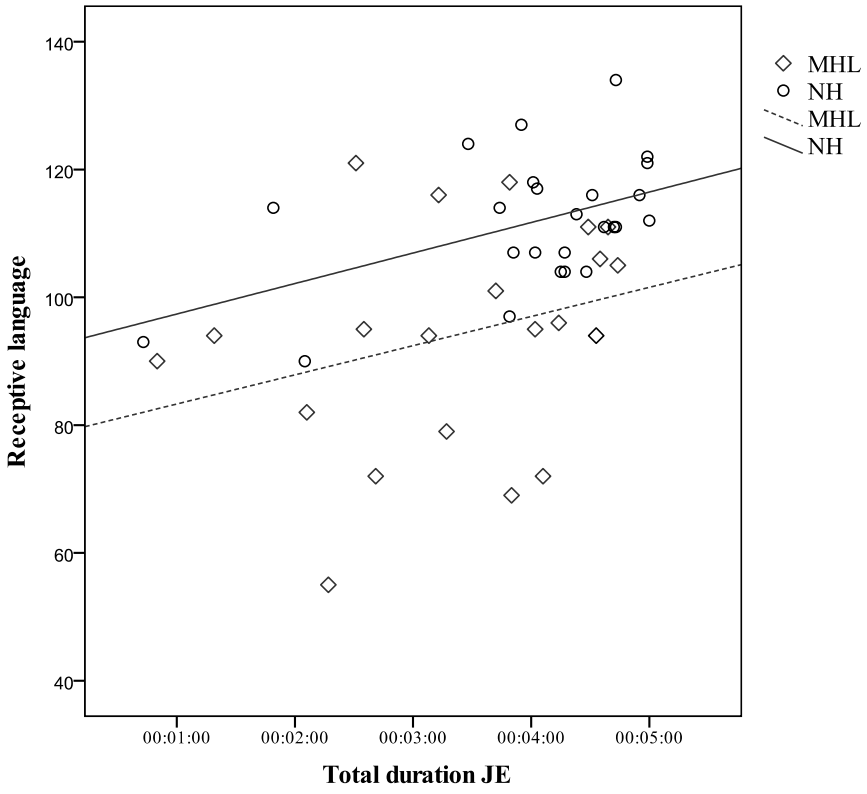


**Figure 1.** This figure shows the relation between the duration of joint engagement (JE) and receptive language standard scores by group

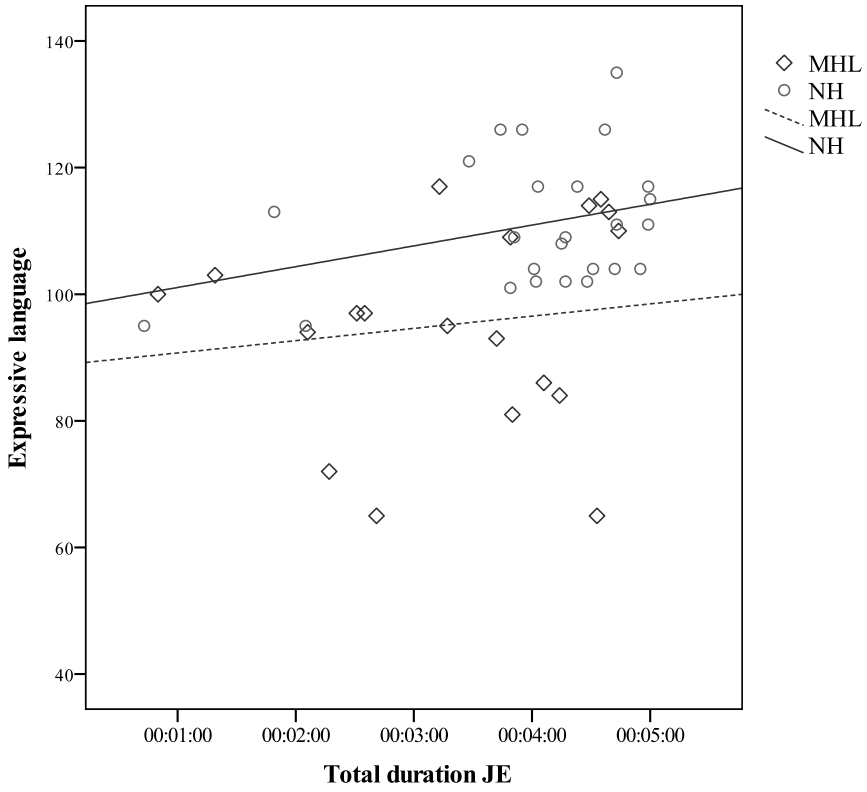


**Figure 2.** This figure shows the relation between the duration of joint engagement (JE) and expressive language standard scores by group

**Table 4.** Correlations emotional availability and duration of joint engagement

| | Total duration JE | Mean time of JE |
|---|---|---|
| C- Responsiveness | .47*** | .21 |
| C- Involvement | .47*** | .30* |
| P-Sensitivity | .31* | .18 |
| P-Non-Intrusiveness | .46*** | .25 |
| P-Structuring | .54*** | .30* |

Abbreviation: JE Joint Engagement. * $p < 0.05$, *** $p < 0.00$

## DISCUSSION

Parent-child interactions are crucially important for a child's development (Bornstein et al., 2010). Children with a disability, such as hearing loss, may need to rely even more strongly on a positive and supporting relationship with their caregivers (Pressman et al., 1999). To the best of our knowledge, this study is the first to examine joint engagement and emotional availability of parent-child interactions in a special group that has received little attention in the research literature. The outcomes of the current study revealed that children with MHL and their parents were less successful in establishing joint engagement compared with children with NH and their parents. Also, they had briefer episodes of joint engagement. No differences between groups were found for the levels of emotional availability. Children with better language abilities had interactions with longer episodes of joint engagement and higher levels of emotional availability.

In line with the results of studies on children with more severe HL (Gale & Schick, 2009; Cejas et al., 2014; Prezbindowski et al., 2015), the children with MHL in our study also engaged in briefer episodes of joint engagement with their parents than the children with NH. One reason for these briefer episodes might be the lower language abilities of children with MHL compared to children with NH. In our study children with lower language abilities had briefer episodes of joint engagement. This confirms similar results in children with severe to profound HL (Cejas et al., 2014). Language is an important factor in keeping interactions going. Understanding what the other is saying is necessary for responding adequately. When social partners fail to understand each other well, communication breakdowns lay ahead, resulting in briefer episodes of joint engagement.

Children with NH and their parents can use spoken language for an ongoing interaction even without making eye contact. Spoken language is less accessible in noisy environments for children with MHL. Therefore, they need to divide their visual attention between their parent and their toys during play to maintain joint engagement. Because the children in our sample were quite young, they might have been less experienced in using both auditory and visual information simultaneously.

Another explanation for the briefer episodes of joint engagement might be the lower success rate of establishing joint engagement in the MHL group. The skills needed to establish joint engagement are probably also needed to maintain joint engagement. Possibly, children with MHL were less skilled in directing a parent's attention or their parents were less responsive to their initiations and vice versa. The results were in line with Nittrouer (2010) who reported that parents of children with moderate to profound HL were less verbally responsive to their children's initiations. Also, in comparison with deaf parents, hearing parents of children with HL used less visual-tactile engagement strategies than deaf parents during interactions (Loots et al., 2005). Loots et al. suggested that hearing parents of children with HL should learn visual-tactile engagement strategies in order to better facilitate communicative exchange with their children.

The findings of the current study have implications for how children with MHL engage in social interactions and, by doing so, enhance their language skills. When interactions between parents and children are briefer, parents have less opportunity to expand their children's vocabulary. Furthermore, briefer interactions might also provide fewer opportunities to exchange social information.

The findings of the analyses regarding the levels of emotional availability in the parent-child interactions were positive. The interactions of children with and without MHL did not differ on any of the emotional availability measures. Parents of toddlers with MHL were sensitive to their children's signals and needs and they responded accurately with affect and pleasure to them, comparable to the interactions of parents of NH children. Furthermore, parents of both groups of toddlers structured their child's play, and they tended to follow their child's lead. The children with MHL were responsive to their parents; they showed pleasure and eagerness in the interactions. Further, they involved their parents in a comfortable, affectively positive manner into their play, just like their NH peers.



The emotional availability outcomes seem to contrast those concerning joint engagement. While both measures reflected interaction aspects such as responsive behavior and initiation skills, note that one is a more a qualitative measure and the other more quantitative. Although the proportion of successful initiations is lower in the MHL group and the episodes are briefer, children and their parents engage with pleasure and affect when they have episodes of joint engagement. Qualitative aspects of parent-child interaction such as affect, respect for child's autonomy, and having fun together did not seem to be negatively affected in children with MHL. Emotional availability measures were related to the duration of joint engagement. Parent-child interactions with higher levels of emotional availability had longer episodes of joint engagement.

The outcomes of our study contrast with findings of studies with CI children. Quittner and colleagues (2013) for example reported the children with CI attained lower levels of emotional availability in parent-child interactions when compared to hearing children. Attaining optimal emotional availability may be easier for children with MHL than CI children. Since most deaf children receive a CI around their first birthday, they have more limited auditory access during the first months of life than MHL children. Infants with MHL will respond more often to their parent's voices and sounds than profoundly deaf children, which may impact the early interactions with their parents. Indeed, the sample of Quittner et al. included deaf children who received a CI between five months and five years of age.

Alternatively, the setting in which the video-recordings were made might have been different in the two studies. In the present study, video-recordings of the parent and child playing were made at home, while in the Quittner et al. (2013) study the recordings were made at the CI center. Parents might feel more confident in their home environment and

consequently may have interacted more naturally. CI children undergo an intensive rehabilitation period with frequent visits to CI centers. These visits might be stressful for parents and this may impact the interaction during the video-recordings. Future research could further examine the differences in outcomes between the two studies and test the possible explanations suggested here.

Children's language abilities were positively related to both the duration of joint engagement and levels of emotional availability, conform to studies in other groups of children with HL (Van Dam et al. 2012; Quittner et al. 2013; Cejas et al. 2014; Ambrose et al. 2015). Higher levels of emotional availability were related to better receptive and expressive language skills. Furthermore, children who engaged in longer episodes of joint engagement with their parents had better language skills than children who engaged in briefer interactions. Since children with MHL are at risk for language difficulties (Tomblin et al. 2015b), parent-child interactions are a critical target for family-centered early intervention programs.

In the current study we focused on a well-defined group of children with MHL. This group of children has only recently become the focus of research (e.g. Ambrose et al. 2015; McCreery et al., 2015; Stika et al. 2013; Netten et al. 2015, 2016; Tomblin et al., 2015b; Laugen et al. 2016a, 2016b; Walker et al. 2015). For example, in the OCHL study (Tomblin et al., 2015), the language outcomes of infants and preschool-age with mild-to-severe HL were longitudinally examined. The results of Tomblin et al. indicated that these children are at risk of language difficulties, a finding in line with our results and other studies on this population (Koehlinger et al. 2013; Netten et al. 2015; Hammer & Coene, 2016). The findings of the current study revealed more insight in the association between MHL children's language ability and the interaction with their parents.

In addition to language difficulties, social-emotional delays and/or difficulties have been reported in studies on children with MHL (Dirks et al. 2017, Laugen et al. 2016; Netten et al. 2017). For example, 30-month-old toddlers with MHL lagged behind their hearing peers in joint attention and intention understanding (Dirks et al.). In an older group of MHL children (3 to 5 year olds), difficulties with theory of mind reasoning (Netten et al.) and more psychosocial problems (Laugen et al.) were reported. More longitudinal research into this group of children is needed to find out whether the children with MHL catch up with their NH peers. Furthermore, the relation between parent-child interaction and the social-emotional development of children with MHL is also relevant to explore in future studies.

A relatively high percentage of children with parents with HL participated in this study. We used no specific requirement strategies that could explain this percentage. A high percentage (18%) was also reported in a recent study of Wong et al.. In many studies children with parents with HL are excluded, which might have caused a bias in these samples. This could be an important issue to address in future studies.

**Clinical implications**

While the groups did not differ in terms of the mean level of emotional availability, some parent-child interactions in both groups received low scores. This may indicate that early intervention is necessary for some parents and children with MHL, given the relationship between parent-child interaction and both language development. Further, the briefer episodes of joint engagement and the lower success rate of establishing joint engagement ask for effective interventions that enhance parent's communication strategies. Video-feedback interventions have proven to be effective in promoting emotional availability in hearing children with behavioral problems (Fukkink, 2008). In a recent study in children with HL, a short video-feedback intervention was used to promote parents' self-esteem and communication strategies (Lam et al. 2015). In addition, increases in emotional availability were also reported.



**Limitations**

One potential limitation of this study is the focus solely on the relation between parent-child interaction and language development. Since children with MHL are also at risk of social-emotional difficulties, it is also relevant to examine the relationship between parent-child interactions and children's social-emotional development. This would give a broader view of the interactions between important variables which are related to the development of children with MHL. Another limitation is the cross-sectional and correlational nature of the study, which did not allow specifying the direction of the associations between parent-child interaction and language ability. Although the results of Quittner et al. (2013) in CI children suggest that emotional availability is predictive of language outcomes, further studies in MHL children are needed.

**Conclusions**

The present study shows that there are comparable levels of emotional availability in the interactions between parents and toddlers with MHL, and the interactions between parents and NH toddlers. Since emotional availability is an important predictor of positive child outcomes, these findings are promising. Higher levels of emotional availability were related to better language ability. The episodes of joint engagement of MHL toddlers and their parents were briefer than those of their peers with NH and they had more difficulties in establishing joint engagement. These results suggest that it may be more difficult for parents to have ongoing interactions when their child has MHL. Given the relationship between emotional availability and various areas of child development, professionals working with the MHL population should be alert to less optimal interactions, and information about early parent-child interactions should be emphasized in early intervention programs.

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CHAPTER 5

# Talk with me! Parental Linguistic Input to Toddlers with Moderate Hearing loss

*Submitted*

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## ABSTRACT

**Objectives**

The purpose of this study was to examine parental linguistic input to toddlers with moderate hearing loss (MHL) compared with toddlers with normal hearing (NH). In particular, the relationship between parental linguistic input and children's language abilities was examined.

**Method**

Eighteen toddlers with MHL and 24 toddlers with NH and their parents participated in the study. The quantity and quality of parental linguistic input during a 10-minute free play activity with parents was recorded and later coded using Ambrose et al.'s (2015) coding system. In addition, the use of mental state language was also coded.

**Results**

Toddlers with MHL were exposed to an equivalent amount of parental linguistic input as toddlers with NH. Parents of toddlers with MHL used less high-level facilitative language techniques, used less mental state language, and had a more limited vocabulary and shorter utterances than parents of toddlers with NH. The quantity and quality of parental linguistic input was positively related to children's language abilities.

**Conclusions**

The quality of parental linguistic input differed between parents of toddlers with MHL and toddlers with NH. Toddlers with MHL were exposed to a less rich language. No differences between the two groups were found in the quantity of parental linguistic input. The quantity and quality of parental linguistic input was related to children's language abilities. Early intervention programs should therefore focus on promoting optimal language environments for children with MHL.

## INTRODUCTION

Language acquisition occurs by means of interactions with knowledgeable others (Vygotsky, 1978). Parents have a crucial role in the language development of their young children. By talking to children about what they are seeing or doing, parents promote children's language abilities. Both the quantity and quality of parental linguistic input can impact a child's language development (Hart & Risley, 1995; Rowe, 2012; Weizman & Snow, 2001).

When a child has a moderate hearing loss (40 -60 dB HL) (MHL), parents may encounter more challenges in providing optimal language input to their children. Since most children with hearing loss (HL) have hearing parents (Mitchell & Karchmer, 2004), parents often have no experience with HL what may hamper their intuitive parent behavior. Given that children with MHL are more at risk for language difficulties (Moeller, Tomblin, Yoshinaga-Itano, Connor, & Jerger, 2007; Tomblin et al., 2015), parents may need to adapt their linguistic input in order to enhance their child's language development. In the current study, the relationship between the quantity and quality of parental linguistic input and the language abilities of toddlers with MHL was examined.



**Parental linguistic input**

A large body of research suggests that parental communication with children is related to children's language development (Hart & Risley, 1995; Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010; Rowe, 2012; Weizman & Snow, 2001). The quantity of parental linguistic input is an important determinant of children's vocabulary development (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Weizman & Snow, 2001). Children have better language skills when their parents talk more frequently to them and expose them to a larger amount of words. The more talk a child is exposed to, the more opportunities they have to become familiar with certain words, and to practice skills important for word learning (Weisleder & Fernald, 2013). The variety and type of parental talk is also associated with child language development (Huttenlocher, et al., 2010). Parents who apply a more extensive vocabulary in their child-directed communication have children with more extensive vocabularies (Hart & Risley, 1995; Hoff & Naigles, 2002; Taumoepeau, 2016).

Various quality features of parental linguistic input have been identified in the literature. Some of these features which require more complex verbal responses (for example open-ended questions) are positively related to child language skills (Rowe, Leech, & Cabrera, 2017). Parallel talk (talking about what a child is doing, seeing, or touching), expansion (restating and completing a child's utterance with correct grammar), and recasting (changing a child's utterance into a question) are other examples of so-called high-level facilitative language techniques that are associated with better receptive and expressive language skills (Cruz, Quittner, Marker, DesJardin, & Team, 2013; Girolametto, Weitzman,

Wiigs, & Pearce, 1999). Examples of low-level facilitative language techniques are imitation (repeating a child's utterance), labeling (stating the name of an object or picture), and linguistic mapping (putting into words what a child may be trying to communicate). Research suggests that low-level facilitative language techniques promote language development in young children at the pre-linguistic stage (Girolametto et al.; Yoder & Warren, 2001), whereas high-level facilitative techniques enhances this development in older children who use more complex language structures (Rowe, 2012). In sum, while the quantity and quality of parental talk is related to children's language development, this relation may be dependent on the child's age.

**Parental linguistic input to children with MHL**

Children with MHL are more at risk for language difficulties than children with normal hearing (NH) (Moeller et al., 2007; Tomblin et al., 2015). Despite their use of hearing aids, most children with MHL have inconsistent access to speech, which may impact their language development (Bagatto, Moodie, Seewald, Bartlett, & Scollie, 2011; McCreery et al., 2015; Stiles, Bentler, & McGregor, 2012). Early intervention programs for children with HL are often focused on optimizing children's language development; these programs emphasize the potential role that parents can play (Moeller, Carr, Seaver, Stredler-Brown, & Holzinger, 2013). The assumption is that (qualitatively) rich conversations between parent and child will boost the language abilities of children with MHL. It is therefore important to identify strategies that promote high quality language use by parents in their interactions with children with MHL.

A limited number of studies of children with MHL (40-60 dB HL) have been published which examine the parent linguistic input. Most of these studies included children with mild to severe HL (20-90 dB) and were not specifically focused on children with MHL (Ambrose, VanDam, & Moeller, 2014; Ambrose, Walker, Unflat-Berry, Oleson, & Moeller, 2015; DesJardin et al., 2014; VanDam, Ambrose, & Moeller, 2012). Outcomes of these studies showed that children (two years of age and younger) with mild to severe HL were exposed to a similar amount of parental talk than children with NH (VanDam et al.; Ambrose et al., 2015). These findings were in line with those of Nittrouer (2010) and Aragon and Yoshinaga-Itano (2012) who studied groups of children with a range of HL (both hard-of-hearing and deaf). Ambrose et al. (2015), however, reported differences between three-year-olds with mild to severe HL in terms of the quantity of parental linguistic input. Three-year-old children with MHL in their study were exposed to fewer words than their peers with NH. Furthermore, they also found that these children were exposed to a limited variety of words and shorter utterances, features of linguistic input that reflect the quality of the input. Ambrose et al. (2015) noted that parents of children with HL may have adapted their own language levels as a result of their sensitivity to the lower language abilities of their children. While language differences between young children with HL and young children with NH are less obvious, they become more apparent when children grow older and consequently, parents may adapt their language levels

accordingly. This reasoning may explain why differences in the amount of words, the variety of words and length of utterance were found between three-year-old children with HL and NH but not in two-year-olds.

The quality of linguistic input is also reflected by parents' use of facilitative language techniques. Ambrose et al. (2015) and Desjardin et al. (2014) examined the use of these techniques during parent-child interactions in children with mild to severe HL. Parents' use of high-level facilitative language techniques such as recasting, asking open-ended questions, and expansion was positively related to children's oral language abilities (Ambrose et al.; Desjardin et al.). These findings are in line with research on children with cochlear implants (Cruz, et al., 2013; DesJardin & Eisenberg, 2007) and on children with moderate to profound HL (Nittrouer, 2010). While parents' use of high-level language techniques is thus important in promoting the language abilities of children with mild to severe HL, parents of these children used high-level language techniques less frequently than parents of children with NH (Ambrose et al.).



Ambrose and colleagues (2015) however also reported that parents of children with mild to severe HL used more directing language than parents of children with NH. This low-level language technique was negatively related to children's language abilities. Directing language is used to direct a child's attention or behavior (e.g. "Say Mummy"; "Look here"; "Don't touch that). Not all low-level language techniques are (negatively) related to language abilities in children with mild to severe HL. Desjardin and colleagues (2014) for example found that a composite score of low-level techniques (e.g. labeling, linguistic mapping, commenting, directing, asking closed-ended questions, and imitating) was not related to language abilities of children with mild to severe HL. The use of a composite score of low-level language techniques and the larger age range of the children included in the study may have resulted in different outcomes than those reported by Ambrose and colleagues. Parents' talk to children with mild to severe HL did seem to change over time: parents used less directive language and provided their children with more high-level language when their children were older (Ambrose et al.).

**Mental state language**

Parental language input is not only important for children's language development but also for their social-emotional development. Talking with children about their own and others' thoughts, desires and feelings promotes their social-emotional development (Devine & Hughes, 2016; Drummond, Paul, Waugh, Hammond, & Brownell, 2014; Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Meins, 2013; Peterson & Slaughter, 2003). Parents' use of mental state language (e.g. think; know; believe; remember; want) is positively related to children's development of a Theory of Mind (Devine & Hughes, 2016). In particular, parents' use of mental state language is positively related to a child's performance on false belief tasks (Devine & Hughes; Taumoepeau & Ruffman, 2008), which require children to understand, explain, and predict the actions of others. The use of mental state language can be considered as a specific high-level language technique.

Until now, two studies have examined parents' use of mental state language in interactions with children with HL (Moeller & Schick, 2006; Morgan et al., 2014). In their study of deaf five-year-old children, Moeller & Schick coded signed references to mental states during mother-child interactions. Verbal expressions were coded for the hearing controls. Although there were no differences in the total number of utterances, mothers of deaf children made less frequent and less varied references to mental states than mothers of children with NH. The study also reported that children with mothers who made more mentale states references showed a better false belief understanding. Reduced access to mental state language was also reported in a younger group of children with HL (Morgan et al.). Mothers of deaf infants included in this study referred less often to mental states during spoken conversations about pictures showing social situations, than mothers of children with NH. The conversations between mothers and the deaf infants were also less connected. Mothers of deaf infants more often initiated the interaction and they had more difficulties in maintaining the conversation, than mothers of children with NH. Having conversations about the mind might be especially important for children with MHL who often lag behind their peers with NH in their social-emotional development (Dirks et al., 2017; Laugen, Jacobsen, Rieffe, & Wichstrom, 2016, 2017; Netten et al., 2015, 2017).

**Present study**

Recently, studies on young children with mild to severe HL have received increasing attention in the literature (e.g. Koehlinger, Van Horne, & Moeller, 2013; Laugen et al., 2016; Moeller & Tomblin, 2015; Netten et al., 2017; Stika et al., 2013). These studies indicate that even children with less severe HL are at risk for language delays (Koehlinger et al., 2013; Netten, et al., 2015; Tomblin, et al., 2015) and social-emotional difficulties ( Dirks, et al., 2017; Laugen, et al., 2016; Netten, et al., 2017). It is therefore essential that further research is conducted in order to gain insights into how the language and social-emotional development of children with less severe HL (MHL) can be facilitated. Parents play a crucial role in enhancing children's language development. The focus of the current study is on the quality and quantity of parental linguistic input in relation to the language abilities of 30-month-old toddlers with MHL.

In order to examine the quality of parental linguistic input, the current study used the coding system developed by Ambrose et al. (2015) and used in their study with a similar population (children with mild to severe HL aged approximately 18 and/or 36 months of age). Using the same coding system would allow us to find out whether we could replicate Ambrose and colleagues' findings in Dutch 30-month-old children with MHL. To enable exploration of the use of mental state language, mental state terms were also coded separately. In line with findings of Ambrose et al., we expected that parents of toddlers with MHL used more low-level language and exposed their children to less high-level language than parents of children with NH, including mental state terms (Moeller & Schick, 2006; Morgan et al., 2014). Positive relations between language ability and high-level

language use were expected, in addition to negative relations between language ability and low-level language.

We expected that parents of children with MHL used fewer words during parent-child interactions than parents of children with NH (Ambrose et al., 2015). Furthermore, positive relations were expected between the quantity of parental linguistic input and language abilities (Ambrose et al.). Next to the relation between linguistic input and language abilities, the relation between hearing loss-related variables (e.g. degree of HL and start intervention) and linguistic input was examined.

## METHOD



**Participants**

This study is part of a larger study on the psychosocial functioning of toddlers with MHL and their families (xx, xx, self-identifying references are removed here for double-blind reviewing procedure. In total, 42 children between 29 and 33 months of age participated in this study. The 18 children with MHL were recruited from two family-centered early intervention centers in the Netherlands. The control group of 24 children with NH was recruited via a well-baby clinic. The children with NH were included in the study if they had passed the neonatal hearing screening and had no known medical or developmental disabilities. Children with MHL were included in the study if they were diagnosed with congenital moderate hearing losses (40-60 dB HL) in the better ear (residual hearing was calculated by averaging unaided hearing thresholds at 500, 1,000 and 2,000 Hz) and they had no other medical or developmental disability such as mental retardation, visual impairment or speech-motor problems. Characteristics of the samples are reported in Table 1. Age, gender and maternal education level did not differ between the groups.

The hearing children were born to parents with NH. Of the sample of children with MHL, four fathers and one mother had MHL and one father was deaf. None of the children had more than one parent with hearing loss. At home the children used spoken language in the interactions with their parents (6 parents and children supported their spoken language often with signs, 1, always, 9 sometimes and 2 never). All children with MHL wore hearing aids and received care from an audiologist. Furthermore, all children with MHL participated in a family-centered early intervention program for children with HL. The family-centered early intervention program offered entailed frequent house visits by early interventionists and speech and language therapists, parent courses at the center together with other parents (e.g., sign courses, communication courses, and interactive reading courses) and specialized treatment groups for toddlers with HL.

**Procedure**

Members of the research team visited the families at home. The children and their parents engaged in a 10-minute free-play session with standardized toys. The toys were age appropriate and included building blocks (that could be used to build and as a puzzle), animal figures, and a tea set. Parents were asked to play with their child the way they usually did. All interactions were videotaped. The majority of parent-child interaction videos (93%) included the mother and the remaining interactions included the father (MHL = 2 and NH = 1). In the majority of videotaped interactions, parents with NH interacted with their child; one parent-child interaction included a mother with MHL.

Parents were asked to fill in a questionnaire about their family's background. Additional information, such as degree of hearing loss and age at amplification was obtained from medical records. Speech and language therapists assessed the language ability of the children. The study was carried out in accordance with the standards set by the Declaration of Helsinki and informed consent was obtained for all children.

**Table 1.** Demographic characteristics of the MHL and NH groups

| | MHL | NH |
|---|---|---|
| No. of children | 18 | 24 |
| Age, mean (SD) months | 30.7 (1.0) | 31.0 (0.9) |
| Age, range months | 29-33 | 30-33 |
| Gender, no (%) | | |
| Male | 6 (25%) | 12 (50%) |
| Female | 12 (75%) | 12 (50%) |
| Maternal educational level, mean (SD)*[1] | 2.9 (1.7) | 3.2 (0.9) |
| Degree of hearing loss (dB), mean (SD) | 53.6 (8.7) | NA |
| Age at start FCEI (months), mean (SD) | 7.3 (7.5) | NA |
| Age at start FCEI (months), range | 1-24 | NA |
| Age at HA fit (months), mean (SD) | 6.5 (5.7) | NA |
| Age at HA fit (months), range | 1-22 | NA |

Abbreviations: MHL Moderate Hearing Loss, NH Normal Hearing, SD Standard Deviation, NA Not Available; FCEI, Family-Centered Early Intervention; HA Hearing Aid.

*[1] (1 = no/primary education, 2 = lower general secondary education, 3 = higher general education, 4 = college/university).

**Measures**

***Language ability***

Linguists assessed the children's receptive and expressive language abilities via two language tests that have been developed and standardized for children between two and five years of age. These tests are widely used for children with and without HL within the Netherlands. Receptive language ability was assessed with the Reynell Developmental Language Scales - Dutch Version (Schaerlaekens A, 1993). Expressive language ability

was assessed with the Sentence Development Scale of the Schlichting Expressive Language Test (Schlichting, Eldik, Lutje Spelberg, Van der Meulen, & Van der Meulen, 1995). Raw scores are converted to age equivalents and language quotients. The quotient scores are normally distributed scores, with a mean score of 100 and a standard deviation of 15.

***Parental linguistic input***

Three research assistants transcribed video recordings of the parent-child interactions. They followed conventions that allow for coding and transcribing speech using the Codes for the Human Analysis of Transcripts (CHAT). The Computerized Language Analysis (CLAN) software (MacWhinney, 2000) was used to analyze the transcriptions that were transcribed in CHAT format. CLAN was used to calculate the number of total utterances (NTU), number of total words (NTW), number of different words (NDW), and mean length of utterances (MLU) for parent talk in the samples. Because the parent-child interactions were between 9 ½ and 12 minutes in length (mean: 10.55 min; SD: .39) the counts were divided by the number of minutes in the sample and then multiplied by ten to normalize all count variables to 10 minutes. Ten percent of the videos were transcribed independently from each other to calculate the inter-rater reliability. The percent agreement ranged from 81 to 98% (mean: 90%).



Using a coding procedure developed by Ambrose et al. (2015), parent utterances were coded as serving one of ten mutually exclusive functions: basic acknowledgements, clarification questions, informative statements, informative questions, simple social phrases, test questions, directing utterances, conversational-eliciting utterances that were open ended, conversational-eliciting utterances referencing topics outside the immediate context, and real utterances. Ambrose et al. used the latter four types of utterances (directing, two conversational-eliciting types, and real utterances) in their article because previous literature has indicated that these utterances may specifically enhance or hinder language development (Cruz, et al., 2013; DesJardin & Eisenberg, 2007; Hoff-Ginsberg, 1985; Taumoepeau & Ruffman, 2006; Zimmerman et al., 2009). In line with Ambrose et al. we used these four types of utterances in the current study. Directing utterances are considered lower-level functions which are used to direct a child's attention and/or to tell a child something to do (e.g. "look", "don't touch" or "bring me that cup") (Cruz et al., 2014; Desjardin et al., 2007; Ambrose et al. 2015). Conversational-eliciting utterances (open or outside) and real utterances are considered high-level functions. These utterances are exposed to invite a child to talk or request for information (e.g., Ambrose et al., 2015; Cruz et al. 2013; DesJardin & Eisenberg 2007). Examples of conversational-eliciting utterances are "what kinds of animals do you see" (open) or "tell me about the animals at grandparents' home" (outside) and examples of real utterances are " what color is your favorite toy" or "what is going to happen with Sam". These three types of utterances were added up together to calculate the number of high-level utterances. Then, the proportion of high-level utterances and directing utterances were calculated.

Two research assistants (linguists) who also transcribed the video recordings used the 10-level coding system to code parent's utterances. To establish inter-rater reliability of the coding, the research assistants coded 20% of the sample independently. The intra-class reliability coefficients ranged from .81 to .95 (mean .87).

***Mental state language***

The parent-child interaction transcriptions were used to code the amount of mental state terms used by both parents and children. Mental state terms included references to cognitive terms (e.g. think, know, remember or believe), desires (e.g. "want", "like', "don't like", "hope" or "whish") and emotions (e.g. "happy", "sad", "angry" or "worried") (Ensor & Hughes, 2008; Moeller & Schick, 2006; Morgan, et al., 2014). All of the videos were coded independently from each other by two members of the research team to calculate the inter-rater reliability. The intra-class reliability coefficient was r = .97.

**Statistical analyses**

Group demographics were compared using independent t-tests. Independent t-tests were also used to test for differences between groups in the language ability and the parental linguistic input. Effect size was estimated with Cohen's *d.* Holm's sequential Bonferroni method was used to control for Type 1 error at the .05 level across comparisons. Correlations between the measures were calculated with Pearson's Correlations. These correlations were compared between the two groups using Fisher's *r*-to-*z* transformations to show significant differences in the strength of the correlations.

The assumptions for parametric testing were checked due to the small sample size. When the assumptions were violated, non-parametric analyses were conducted. For two variables (parental mental state language and directives) the assumptions were not met. Yet, the outcomes of the parametric and nonparametric analyses did not show differences. For reasons of clarity, we decided to report the outcomes of the t-tests, in line with the other variables.

## RESULTS

**Between group differences**

Table 2 shows the summary statistics and between group-differences in child language abilities and parental linguistics input. Children with MHL had lower receptive and expressive language scores than the children with NH. No significant differences were found for the quantity of parental linguistic input to children with MHL and NH. Parents of children with MHL used a similar amount of words and utterances during the interactions compared to parents of children with NH. Differences between groups were found for quality measures of language input. Children with MHL were exposed to shorter utterances, fewer different words, less high-level language, and less mental state language.

No significant differences were found in the exposure to low-level language (directing utterances).

**Associations between linguistic input and hearing loss related variables**

The associations between parental linguistic input and hearing loss-related variables are shown in Table 3. Negative associations were found for low-level language input and the start of family-centered early intervention and age of hearing aid (HA) fitting. Children who started the intervention at a young age, and those who were younger at HA fitting were exposed to more low-level language (directing utterances). No other significant associations between parental linguistic input and intervention measures were found. The degree of HL was negatively related to high-level language input and the amount of parental mental state language. Children with more decibels HL were exposed to less high-level language and less mental state language.



**Table 2.** Summary statistics of child language and parental linguistic input

| | Mean scores (SD) | | *t* | *p* | *d* |
|---|---|---|---|---|---|
| | MHL (n = 18) | NH (n =24) | | | |
| Child language ability | | | | | |
| Receptive language*** | 99.4 (13.3) | 111.6 (10.2) | -3.37 | 0.00 | 1.02 |
| Expressive language*** | 94.6 (18.3) | 110.3 (10.8) | -3.42 | 0.00 | 1.04 |
| Mental states**c | 0.9 (1.81) | 2.50 (2.39) | -2.38 | 0.02 | 0.76 |
| Parental linguistic input | | | | | |
| NTU | 128.9 (31.7) | 129.0 (30.6) | -0.37 | 0.72 | 0.00 |
| NTW | 548.8 (197.2) | 623.4 (156.0) | -1.67 | 0.10 | 0.41 |
| NDW** | 148.9 (44.3) | 181.1 (31.7) | -2.98 | 0.00 | 0.84 |
| MLU** | 4.0 (0.8) | 4.8 (0.6) | -2.86 | 0.00 | 1.87 |
| High level***a | 0.10 (.05) | 0.16 (.04) | -3.74 | 0.00 | 1.33 |
| Low levelb | 0.15 (.05) | 0.15 (.07) | -0.18 | 0.86 | 0.16 |
| Mental states**c | 4.4 (3.4) | 9.0 (5.7) | -3.04 | 0.00 | 0.98 |

Abbreviations: MHL Moderate Hearing Loss, NH Normal Hearing, SD Standard Deviation NTU Number of Total Utterances; NTW Number of Total Words; NDW Number of Different Words; MLU Mean Length of Utterance.
[a,b] Proportion of utterances that were high/low. [c] number of mental state references
*p <.05, **p < .01***, p <.001

**Table 3.** Pearson's Correlation for HL-related variables and parental linguistic input variables

| | NTU | NTW | NDW | MLU | Directing | High level | Mental states |
|---|---|---|---|---|---|---|---|
| Degree of HL | -.09 | -.28 | -.23 | -.41 | .11 | -.79** | -.59* |
| Age at HA fit (months) | -.26 | -.25 | -.15 | -.11 | -.52* | .29 | .01 |
| Age at start FCEI (months) | -.30 | -.37 | -.31 | -.32 | -.49* | .21 | -.15 |

Abbreviations: HA, Hearing Aid; FCEI; Family-Centered Early Intervention
*p <.05, **p <.01

**Associations between linguistic input and language abilities**

Table 4 shows the associations between parental linguistic input and children's language abilities. The number of utterances was unrelated to children's language abilities. Significant positive relations with children's language abilities were found for number of words, length of utterances, and high-level language. More exposure to different words, longer utterances and more high-level language was associated with better receptive language abilities in children with MHL and with NH. Low-level language (directing utterances) was negatively related to children's receptive language abilities. More high-level language, more exposure to different words and mental state language was related to better expressive language abilities in both children with MHL and NH. Longer utterances and more total words were related to better expressive language abilities in children with MHL but not in children with NH. Pearson's correlations between maternal educational level and parental linguistic input or children's language abilities revealed no significant associations.

**Table 4.** Pearson's correlations for parental linguistic input variables and child language scores

| | Receptive language | Expressive language |
|---|---|---|
| NTU | .26 | .19 |
| NTW | .39* | .70***/ .05 |
| NDW | .36* | .47* |
| MLU | .38* | .67**/ .05 |
| High level[a] | .29* | .44** |
| Low level[b] | -.29* | -.11 |
| Parental mental state terms[c] | .24 | .35* |

Note. Correlations are provided separately for the children with MHL and NH when these were found to be significantly different (using Fisher Transformation) (MHL/NH).
Abbreviations: NTU Number of Total Utterances; NTW Number of Total Words; NDW Number of Different Words; MLU Mean Length of Utterance.
a,b Proportion of utterances that were high/low
c number of mental state references
*p <.05, ***p <.001

## DISCUSSION

Having a MHL puts children at risk for language difficulties (Tomblin, et al., 2015) and therefore it is important to optimize their language environment. Parents play a crucial role in promoting young children's language abilities (Hart & Risley, 1995). This study examined the quantity and quality of parental linguistic input to toddlers with MHL and toddlers with NH in relation to their language abilities. The outcomes revealed that parents of toddlers with MHL were as talkative to their children as parents of children with NH. However, the quality of their linguistic input differed from that of parents of children with NH. Parents of toddlers with MHL used less high-level language, including fewer mental

states references, a limited vocabulary, and shorter utterances than parent of toddlers with NH. The exposure to low-level language (directing utterances) did not differ between toddlers with MHL and NH. Both the quantity of parents' linguistic input and exposure to high-level language (quality) were positively related to children's language abilities.

Children with MHL were exposed to similar amounts of words and utterances compared to children with NH. These findings are in line with Ambrose et al. (2015), who reported no differences between 18 and/or 36-month-old children with mild to severe HL and NH in the number of exposed utterances. However, Ambrose and colleagues reported that three-year-olds with HL in their study were exposed to fewer words in the interactions with their parents. This difference was not found in the 18-month-olds in the Ambrose et al. study, or in the 30-month-olds in the present study. A possible explanation of these findings may be that parents of children with NH increase the amount of words they use during interactions at an earlier moment in time than parents of children with HL. In addition, the language difficulties of children with HL become more prominent with age and parents may adapt their language input accordingly.



Unlike parents in the studies by Ambrose et al. (2015) and Desjardin et al. (2014), parents of children with and without MHL in our study used a similar amount of low-level language (directing utterances). However, Ambrose and DesJardin coded the parent-child communication during a structured art gallery task (Ambrose et al.) or while reading a picture book (Desjardin et al.). Both tasks may have elicited more directive behavior than the free play activity that was used in the present study. Shifting the child's attention between the object of conversation (a picture or a book) and themselves in the other studies might have required parents to use more directive language. Another explanation for the inconsistency in the above findings may be related to differences between the studies in the degree of HL in the children studied. In the present study, only children with a HL between 40-60 dB were included (moderate hearing loss), while Ambrose et al. and Desjardin et al. included children between 20-90 dB HL. Low-level parental linguistic input to children with MHL was related to a number of early intervention variables. Negative associations were found between low-level language exposure and the age of HA fitting and start of family-centered early intervention. Children who began the intervention at a younger age were exposed to more directing utterances. These findings may reflect the fact that parents are taught to use directive strategies (e.g., to stimulate eye contact and joint attention) from the start of early intervention. The sooner the start of intervention, when children are at the pre-linguistic level, the more likely it may be that parents adapt their communication in a way that is suited for that level (i.e., low-level language input, directing strategies), but less appropriate for the next language level (i.e., high-level language input; Cruz et al., 2013).

Children with MHL were exposed to less high-level language than their peers with NH. Parents of children with MHL used a limited vocabulary, shorter utterances, and fewer

conversational eliciting utterances than parents of children with NH. These results were in line with an earlier study of three-year-old children with mild to severe HL (Ambrose et al., 2015). Another feature of high-level linguistic input is the use of mental state language. Exposure to mental state language is not only beneficial for children's language development but also for their social-emotional development (Moeller & Schick, 2006; Taumoepeau & Ruffman, 2008). In line with findings of Moeller and Schick and Morgan et al. (2014), the results of the current study showed that parents of children with MHL used less mental state language than parents of children with NH.

In line with our expectations and the results of other studies (Ambrose et al., 2015: Cruz et al, 2013; Desjardin et al., 2014; Nittrouer, 2010), children with better expressive and receptive language abilities had parents who used more high-level language, had a more extensive vocabulary, and longer utterances. The reported negative association between the degree of HL and high-level language input by Ambrose et al. was also found in this study, despite the smaller dB range in our study: children with more severe HL were exposed to less high-level language than with less severe HL.

It is unclear what the impact of this limited exposure to high-level language is on the language development of children with MHL. One possibility is that it may impede further language development: parents of children with MHL may underestimate their capacities and therefore provide insufficient stimulation for children to attain the next level of development. Another possibility is that parents may appropriately modify their language use to fit the poorer language abilities of children with MHL, relative to children with NH. Parents of children with MHL may in fact be highly sensitive to their children's abilities and adapt their linguistic input accordingly. From a social constructivist perspective, language learning takes place in the "zone of proximal development" (Vygotsky, 1978): parental linguistic input should be sufficiently challenging for a child to learn new words, neither too simple nor too difficult. This requires parents to be sensitive enough to acknowledge a child's changing language abilities and to provide them with more complex input when appropriate.

The current findings have several implications for family-centered early intervention programs for children with MHL and their families. The results suggest that parent-child interactions are related to the language development of children with MHL and that the language abilities of these children are lower than those of their hearing peers. Several implications for practice can be drawn from these findings. First, it is important to carefully monitor a child's language development so their current level of language abilities can be determined. Next, observations of parent-child interactions are needed to gain insights into the current linguistic input by parents. Based on this information, the appropriate level of parental linguistic input that is needed at that moment to promote children's language development can be determined. Early interventionists may coach parents in providing this linguistic input during daily activities by modeling and video-feedback

techniques. Interactive storybook reading may be one of the activities that could be used to elicit rich parent-child conversations to promote children's language and social-emotional development (Dirks & Wauters, 2015).

Interventions in which storybooks are used to promote mental state language are of interest because storybook reading enhances language development in general in children with HL (DesJardin, et al., 2014; Fung, Chow, & McBride-Chang, 2005). Research on reading storybooks to promote mental state language is mostly focused on hearing children (Adrian et al, 2006; Aram, Fine, & Ziv, 2013; Taumoepeau & Reese, 2013). Aram et al. examined the effect of an intervention to promote parents' use of mental state language during storybook reading with hearing children. After the intervention parents and children referred more often to mental state terms than parents and children who did not follow the intervention. Storybook reading could be useful in exposing MHL children to high-level language and mental state language; however, parents do not do this naturally and we need to support them (Dirks & Wauters, 2018).



One limitation of this study is the cross-sectional design, due to which the causality of relationships between linguistic input and children's language abilities cannot be specified. Future studies could longitudinally examine the linguistic input to younger hearing brothers or sisters of children with MHL and compare them with the input to children with MHL at that age. Future studies could also include hearing children with the same language levels as those of children with MHL to compare their linguistic input.

Another limitation is the relatively small sample size. Despite the limited sample, the findings replicated those found by Ambrose et al. (2015). This was one of the first studies that examined parental mental state language in the interactions of young children with MHL. Future studies should investigate the relationship between mental state language and social-emotional development in this group of children.

In this study we examined the linguistic interactions of toddlers with MHL and their parents in their home environment. When children grow up, they also spend time with peers in day-care or playgroups. Given that early interactions between peers are important for children's development, future studies could examine the (linguistic) interactions of children with MHL and their peers.

**Conclusions**

Parental linguistic input to children with MHL was found in the current study to be related to children's language abilities. The quantity of parents talk to children with MHL is similar to that of parents of children with NH. The input is however of a lower quality, with parents using less high-level language and mental state language. A question that requires further examination is whether these parents actually appropriately adapt their language use to their child's current capacities, or whether they could further challenge their child with

MHL by using more high-level language? Early interventionists should carefully monitor children's language abilities and their exposure to (parental) linguistic input in order to optimize and promote their language development.

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CHAPTER 6

# It Takes Two to Read: Interactive Reading with Young Deaf and Hard-of-Hearing Children

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## ABSTRACT

**Objectives**
Interactive storybook reading is an important activity to enhance the emergent literacy skills of young deaf and hard-of-hearing (DHH) children. The objective of the present study was to examine the effect of an interactive reading program on the interactive reading behavior of parents of young DHH children.

**Design**
Parents of 18 DHH toddlers in the Netherlands participated in an interactive reading program for parents of DHH children. Parents and children were videotaped during storybook reading before and after the program and their interactive reading behavior was compared to that of 10 parents who did not participated in the program. The Responsive Adult-Child-Engagement During Joint Book Reading Scale (DesJardin et al., 2014) was used to code the interactive reading behavior.

**Results**
The results showed that parents' interactive reading behavior tended to increase after they participated in the interactive reading program. After the program, they applied the interactive reading strategies more often than parents who had not participated in the program.

**Conclusions**
The findings suggest that participating in the interactive reading programs improved parents' interactive reading behavior. Therefore, it is recommended to incorporate interactive reading programs into early intervention programs for DHH children.


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## INTRODUCTION

Deaf and hard-of-hearing (DHH) children are more at risk for reading difficulties than hearing children (Traxler, 2000; Wauters, van Bon, Tellings, & van Leeuwe, 2006). To become a good reader, children need to possess skills such as expressive language, word knowledge, conceptual knowledge, narrative skills, and print knowledge (Ehri, 2005; Storch & Whitehurst, 2002). Because these skills are important precursors for later reading ability, they should receive early attention through experiences with literacy activities (Storch & Whitehurst, 2002). This may be self-evident for many young hearing children, but is even more important for DHH children who need more explicit opportunities to participate and profit from literacy activities to develop their emergent literacy skills to the same level as hearing children (Williams, 2004).

The concept of emergent literacy refers to the process through which children develop skills, knowledge, and attitudes about reading and writing before they start formal reading instruction (Vukelich & Christie, 2009; Whitehurst & Lonigan, 1998). The stage of emergent literacy starts as early as birth, when children start to develop their language and communication skills. In developing their language, they learn about the complex system of symbols and rules of the language, increase their vocabularies, and develop their communication skills (Barton & Brophy-Herb, 2006; Roskos, Tabors, & Lenhart, 2009). As children grow older, they develop their phonological awareness and their print knowledge (conventions, forms, and functions of print) (Vukelich & Christie, 2009). Children's literacy experiences in the early years provide the foundation for later literacy development and are essential for their motivation to learn to read and write (Storch & Whitehurst, 2002).



Parental involvement is a critical factor in the development of children's emergent literacy skills (Easterbrooks, Lederberg, & Connor, 2010). This might be even more important for DHH children, given that past research has shown that parental involvement in early intervention (Moeller, 2000) and in school programs (Calderon, 2000) was related to DHH children's language and literacy skills. Moeller (2000) found a high positive correlation in early intervention between parental involvement (measured by ratings from early interventionists about parent participation in program-related meetings and quality of communicative parent-child interactions) and children's vocabulary skills.

One activity that has been found to enhance these emergent literacy skills, both in hearing and DHH children, is parent-child interactive storybook reading (Bus, Van Ijzendoorn, & Pellegrini, 1995; DesJardin, Ambrose, & Eisenberg, 2009). Research indicates that most parents do not apply the techniques of interactive reading spontaneously but need training or instruction to do so (Huebner & Meltzoff, 2005; Mol, Bus, de Jong, & Smeets, 2008; Senechal, 1997). Most studies on the effects of interactive reading programs show positive results. However, these studies have focused on children with typical hearing levels (Huebner, 2000; Huebner & Meltzoff, 2005) or older deaf children (Fung, Chow, &

McBride-Chang, 2005). The present study is the first study that investigated the effect of an interactive reading program on the reading behavior of parents of younger DHH children (between 20 and 46 months of age).

**Interactive storybook reading**

Storybook reading is an important activity to enhance children's emergent literacy skills and later reading performance (Bus et al., 1995). During storybook reading children are exposed to novel words and more complex sentence structures. Adults use more formal language during storybook reading than in their daily conversations with the child, and they talk more about topics beyond the here and now (De Temple & Snow, 2003). Through storybook reading children learn how to handle a book – for example, reading a book from left to right, front to back – and are exposed to print. These are all important aspects of storybook reading that promote emergent literacy skills. Further, storybook reading cultivates an interest in reading and is a predictor for later reading motivation (DesJardin et al., 2014).

The frequency of storybook reading is positively related to a child's vocabulary and literacy development (Bus et al., 1995; Senechal & Young, 2008). In general, the more frequently a child is read to, the better the outcomes (Bus et al., 1995). However, it is not only the quantity that counts, the nature of storybook reading is also important. Storybook reading is most effective when children are actively involved in the reading activity (Mol et al., 2008). This so-called *interactive reading* requires adults to "read *with* their child rather than reading *to* their child" (Dirks & Wauters, 2015, p. 420). Interactive reading is defined as reading aloud that includes conversations, turn-taking, and involving the child in the reading activity (DeBruin-Parecki, 2007). The adult can involve the child by asking questions, relating the story to personal experiences, actively responding to initiatives by the child, and providing positive feedback (DeBruin-Parecki, 2007; DesJardin et al., 2014). Within the context of the sociocultural theory, interactive reading helps the child to acquire knowledge, through the interaction with an adult, that would not be acquired if the child were reading alone (Robertson, Dow, & Hainzinger, 2006).

Research in hearing children has shown that interactive reading is positively associated with children's expressive vocabulary skills, narrative skills, phonological awareness, and knowledge of print (Bus et al., 1995; Trivette, Dunst, & Gorman, 2010). A research synthesis by Trivette and colleagues (2010) examined the effect of different characteristics of interactive reading on language development in 21 studies, which together included 1275 young children (12-42 months old). Findings showed that interactive reading strategies that promoted engagement and active child participation facilitated expressive language development. More specifically, strategies that linked the book to a child's own experiences, involved providing positive feedback during reading and asking the child open-ended questions were positively related to children's expressive language skills.

Although the importance of interactive reading is recognized, adults do not typically read this way without instruction (Huebner & Meltzoff, 2005). Various studies have shown that instruction in interactive reading leads to changes in reading style that have a positive effect on children's language skills (Fung, Chow, & McBride-Chang, 2005; Huebner, 2000; Huebner & Meltzoff, 2005). Huebner and colleagues (2000, 2005) showed that parents' use of an interactive reading style increased significantly after instruction. Before instruction parents just read the text directly without engaging their (hearing) children (two- and three-year-olds) in conversations about the story. After instruction parents involved their children more in telling the story, asked more questions, and labeled pictures more. In sum, interactive reading is an important method to enhance children's emergent literacy skills, and interventions are effective in promoting parents' use of interactive reading strategies.

**Benefits of interactive storybook reading for DHH children**

Interactive reading may be particularly beneficial for DHH children, who are more at risk for difficulties in language and reading (Easterbrooks & Beal-Alvarez, 2013; Harris & Terlektsi, & Kyle, 2017; Traxler, 2000). Though studies examining the effect of interactive reading activities on DHH children outcome measures are few in number, their findings are very promising (Aram, Most, & Mayafit, 2006; DesJardin et al., 2009; DesJardin et al., 2014; Fung et al., 2005).



Fung et al., (2005) showed that the use of interactive reading techniques during storybook reading was positively related to DHH children's receptive vocabulary skills. Aram and colleagues (2006) investigated interactive reading as a predictor for literacy skills in 30 Israeli DHH kindergartners. Their findings indicated that interactive reading predicted phonological awareness, general knowledge, and receptive vocabulary. These findings are supported by a study by DesJardin and colleagues (2009) on literacy skills in two- to seven-year-old children with cochlear implants. In this study, the mother's early use of facilitative language techniques (for example, asking open-ended questions and restating a child's utterance into a question format) during interactive reading was positively related to later phonological awareness and reading skills (e.g., letter-word identification, reading vocabulary, and passage comprehension).

In a more recent study, DesJardin and colleagues (2014) investigated the relation between the quality of interactive reading and language skills in 45 young DHH children (mean age 33 months). Parents and their children were videotaped during storybook reading, and the children's receptive and expressive oral language skills were tested after the reading session. Parental behaviors such as posing and soliciting questions about the book's content, pointing to letters and words in the book, soliciting predictions about the story, and referring to characters and settings were shown to be positively related to the child's expressive language skills. DesJardin et al. concluded that interactive reading is a good way to promote language development in young DHH children. They suggested that early

childhood professionals should support parents of DHH children in using interactive reading strategies when reading storybooks with their children.

Trussell and Easterbrooks (2014) studied the effects of interactive reading on vocabulary learning in six DHH kindergartners (4;6 to 6;11 years). The children were involved in a scripted storybook intervention in which they were asked questions using the CROWD prompts (completion, recall, open-ended, wh-, and distancing questions). The researcher read three storybooks with the children, and a total of 15 vocabulary words were targeted. When target words occurred in the story, the researcher showed the children an accompanying picture card. Children's vocabulary was tested with a picture-naming task using these picture cards. The intervention occurred four times a week for four weeks; each session took 20 minutes. All children learned all target words during the intervention and still remembered these at follow-up two to three weeks after the intervention ended. The authors suggest that future studies should look at teacher- or parent-implemented storybook interactions and include appropriate levels of training.

**Training parents of DHH children in interactive reading**

Parent training programs for interactive reading (hereafter referred to as interactive reading programs) proved to be effective in training parents to use higher-level facilitative language techniques and to engage their children in the activity (DeBruin-Parecki, 2009; Huebner, 2000; Huebner & Meltzoff, 2005). However, to our knowledge only one study has examined the effect of a storybook reading intervention on parents of DHH children (Fung et al., 2005). In this study three groups of children (a comparison group, a typical storybook reading group, and an intervention group) were compared on a pretest and posttest of receptive vocabulary. Parents in the intervention group followed an eight-week reading intervention to learn and practice the techniques of interactive reading. Parents were encouraged to ask open questions and were given picture cards to use for asking questions and introducing new ideas to their children. For example, when parents asked a question about the book content the child could point to a card as a response. The receptive vocabulary skills of the children in the reading intervention group improved more than those of the children in the other groups. However, this study included older DHH children (five- to nine-year-olds) and the researchers stated that it would be preferable to practice with interactive reading in younger DHH children to promote their language and emergent literacy skills.

Most interactive reading training programs for parents of young children are developed for hearing parents with hearing children. However, research suggests that interactive storybook reading with young DHH children may be more challenging for hearing parents than for parents who are also deaf. Studies with deaf parents and their deaf children showed that they used specific strategies during book reading (Berke, 2013; Lartz & Lestina, 1995; Swanwick & Watson, 2005). For example, they used facial expressions and body posture to illustrate different characters in the book and made physical prompts like

tapping on a child's shoulder or lap, or moved the book up and down to maintain a child's attention (Lartz & Lestina, 1995). Further, they positioned themselves in a way that ensured they had enough signing space and good eye contact with the child while reading the book (Swanwick & Watson, 2005). Most DHH children are born to hearing parents (Mitchell & Karchmer, 2004). These parents may be challenged by the communication difficulties of their children when they read storybooks with them (DesJardin et al., 2014; Swanwick & Watson, 2007; Zaidman-Zait & Dromi, 2007). Therefore, interactive reading programs for DHH children should include specific strategies that help parents to overcome such challenges.

On the basis of the interactive reading program of the DeBruin-Parecki (2007) and the research of DesJardin et al. (2014) in young DHH children, Dirks and Wauters (2015) proposed strategies for interactive reading with young DHH children that should be part of an interactive reading program for young DHH children (Table 1; for a more detailed description of the strategies see Dirks and Wauters). These strategies were included in an interactive reading program for parents of young DHH children in the Netherlands. In the current study we examined the effect of this program on parent reading behavior.



**Present Study**

Interactive reading has been shown to be positively related to young DHH children's language and literacy skills (DesJardin et al., 2014; Fung et al., 2005). Parents play a crucial role in promoting these skills. Because parents do not typically read interactively with their children, interactive reading programs are developed to promote these skills in parents. While research indicates that for parents of young hearing children interactive reading programs are effective in changing parent reading behavior, we do not know about effects in parents of young DHH children. To the best of our knowledge, no study has yet examined the effect of an interactive reading program on parents of young DHH children.

In the present study the following research question was examined: What is the effect of an interactive reading program on the interactive reading behavior of parents of young DHH children in the Netherlands? The interactive reading program was based on the strategies for interactive reading with DHH children given in Table 1. Given that earlier research has demonstrated the effectiveness of interactive reading programs in parents of young hearing children (DeBruin-Parecki, 2009; Huebner & Meltzoff, 2005), we expected a program of this kind to be effective in enhancing the interactive reading behavior of parents of DHH children. More precisely, we expected that parents would use the interactive reading strategies more often during storybook reading after participating in the program.

**Table 1.** Interactive reading strategies for DHH children[a]

| | |
|---|---|
| 1 | Give child the opportunity to hold the book and turn the pages |
| 2 | Follow the child's lead |
| 3 | Introduce the book by discussing the cover |
| 4 | Use materials and/or toys |
| 5 | Allow enough time to observe, process, and respond |
| 6 | Elaborate on the child's ideas |
| 7 | Praise and reinforce |
| 8 | Ask questions about the story |
| 9 | Relate book content to personal prior experiences of the child |
| 10 | Point to pictures and/or words |
| 11 | Use mimicry, body posture, voice, and signs |
| 12 | Reflect on the story |
| 13 | Reread stories |

Note. DHH = Deaf and hard of hearing. [a]From Dirks and Wauters (2015).

## METHOD

### Participants

A total of 28 parents (four fathers) and their 28 DHH children were included in the current study. All children and their parents were enrolled in a family-centered early intervention program in the Netherlands and were given the opportunity to participate in the interactive reading program. Eighteen parents voluntarily participated in the interactive reading program (experimental group), and ten parents did not (comparison group). Reasons for not participating in the program were parents' busy time schedules or another focus of interest at that moment. None of the parents had participated in an interactive reading program before the start of the study. Parents' educational levels ranged from higher general education to college/university level. The parents of 19 children reported using Sign Supported Dutch as the main communication with their child; the parents of one child used Sign Language of the Netherlands; and the parents of the other eight children used spoken Dutch as their main language. A chi-squared test revealed no significant differences between the parents in the experimental group and comparison group for communication mode.

Table 2 shows the demographics of the children. One child in the experimental group had two deaf parents, and one child in the comparison group had one parent who was hard of hearing. The children had moderate to profound hearing loss. 16 children had cochlear implants, and 12 children used hearing aids. The children ranged from 20 to 46 months of age ($M$ = 34 months; SD = 8.1) at the start of the study. Chi-square and Wilcoxon tests revealed no significant differences between the children in the experimental group and the comparison group for age, gender, and maternal educational level.

**Table 2.** Demographic profile of the children

| | Experimental Group | Comparison Group |
|---|---|---|
| No. of children | 18 | 10 |
| Age in moths, mean (SD) | 33.8 (9.0) | 35.5 (6.5) |
| Age in months, range | 20-46 | 27-46 |
| Gender, no. | | |
| Male | 10 | 5 |
| Female | 8 | 5 |
| Type of amplification, no. | | |
| Cochlear implant | 14 | 2 |
| Hearing aid | 4 | 8 |

*Note.* No. = number, SD = standard deviation.

## Procedure

To examine the effect of the interactive reading training program on parents' reading behavior, a research assistant or early interventionist videotaped the parents and their children with a video camera several times at home during storybook reading. Parents were instructed to read with their child the way they normally would and were not restricted in the time they needed to read the book. The video recordings were between 4 and 15 minutes long.



Figure 1 illustrates the design of the study. Parents and children in the comparison group were videotaped twice, with twelve to fourteen weeks between (pretest and posttest). The parents and children in the experimental group were videotaped during storybook reading two weeks before the start of the interactive reading program (pretest). After the interactive reading program, they were videotaped three times (posttest 1, posttest 2, and follow-up), with 5-7 weeks between each video recording. At pretest and follow-up the parents and children in the experimental group used one of their own books during reading, and at posttest 1 and posttest 2 they used the books provided by the research team (see Reading Materials below). After the video recordings at posttest 2, all books were returned. Data from the follow-up moment were collected for thirteen parents in the experimental group; data of the other five parents were lacking due to organizational issues (e.g., parents not having enough time to make an appointment within the study time-frame, or a child being ill).

Parents were asked to fill in a diary for each week, reporting their experiences of reading the books with their children. Further they could report which of the books they had read and how often. The parents did not succeed in filling in the diary for all weeks, and most parents only filled it in for one or two weeks. Therefore, we did not have reliable data on parents' experiences of interactive book reading during this study.

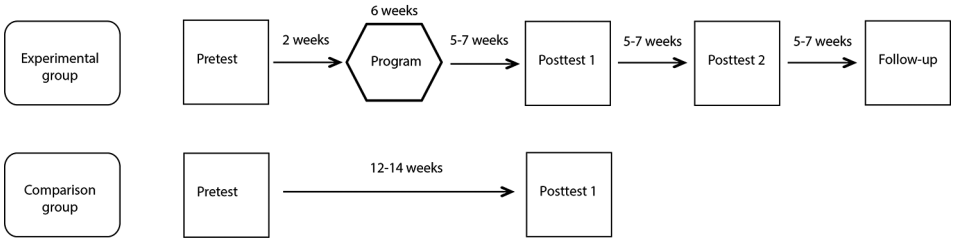


**Figure 1.** Study design.

**Parent interactive reading program**

The researchers of the present study and a speech and language therapist developed the interactive reading program. The program was based on strategies of interactive reading with DHH children (Dirks & Wauters, 2015) and developed for DHH children between two and four years of age. Professionals followed a one-day training given by the developers of the program and received a manual of the program. The manual contained theoretical background information about interactive storybook reading and the use of interactive reading strategies with DHH children. Further, the information to be given to the parents and activities to model and practice the interactive reading strategies were extensively described for each session.

Two professionals (an early interventionist and a speech and language therapist) taught parents the strategies of interactive reading in three two-hour group sessions over a period of six weeks. The trainers used modeling techniques to teach parents the strategies and parents practiced the interactive reading strategies during the sessions. For example, they practiced with introducing the book by discussing the cover, asking open-ended questions, using mimicry and signs, and using book-theme-related materials during reading. Trainers used positive feedback techniques to reinforce parents' interactive reading behavior.

In the first session, parents learned about interactive storybook reading and its importance for children's language and literacy development. Also, the challenges of reading storybooks with DHH children were discussed. The professionals introduced and modeled the strategies for interactive reading with DHH children and parents practiced these strategies. In this session parents received two storybooks and accompanying materials/ toys to practice interactive reading at home with their child. Parents also received fact sheets with suggestions for interactive reading; one general fact sheet and a specific one for each book (see Appendix for the general fact sheet). These fact sheets contained examples of how to introduce the story, types of questions parents could ask, and activities to do after reading the story. Parents were asked to use these materials to practice at home with their children in between the training sessions.

In the second session, parents first talked about their experiences of using the interactive strategies at home with their children. Secondly, strategies to attract and maintain DHH children's attention were taught. Strategies such as tapping a child's arm, waiting, following a child's lead, asking open-ended questions, making signs in a child's visual field were modeled and practiced. At the end of the session parents were asked to record a video at home during storybook reading with their child for the next session.

In the third session, the choice of appropriate books given the child's age and his or her interest in certain characters or themes was discussed. An important part of this session was watching and discussing the videos parents had made at home. Some parents had used their smart phone while others used a video camera to make the recordings. Parents showed their videos and discussed their use of interactive reading strategies and their child's responses with the other parents and trainers. The trainers used positive feedback techniques to reinforce parents' use of interactive reading strategies while reading with their child. Parents' recordings were only part of the reading program and not used to examine the effect of the program.



**Reading materials**

The current study was part of a larger study that examined the use of eBooks for interactive reading (Wauters & Dirks, 2017). In that study, parents' interactive reading behavior when reading eBooks was compared with their reading of print books. The same materials were used in the present study. Half of the parents of the experimental group received five eBooks at the last session of the interactive reading program, and the other half received five print books. After posttest 1, the conditions were switched, so that the parents who had been reading print books now received eBooks and vice versa; these were used for the following five to seven weeks until posttest 2. No differences emerged in parent interactive reading behavior in the eBooks and print books condition (Wauters & Dirks); for this reason, in the present study the posttest scores of both conditions were grouped together.

The five eBooks were adaptations of five existing print storybooks (see Wauters & Dirks, 2017). The text and pictures from the original storybooks were kept intact. The eBooks were developed in such a way that they enhanced the application of interactive reading strategies (e.g., parent or child could turn the pages; readers could set their own pace, giving the child enough time to process and respond; no audio narration was added). All eBooks had the following characteristics: the eBook started with the cover of the book; pages could be turned both forward and backward through swiping (pages did not turn automatically); the printed text was visible; no audio narration was added; a sign dictionary was included for the keywords in the book; no animations were added, but some pictures were automatically zoomed in to draw the attention. The fact sheets that parents received for the eBooks were included in the application and not provided on paper. Because the eBooks were installed on iPads in a test environment and were not yet available for individual's own iPads or other tablets, iPads were loaned to the parents.

**Measurement**

The videos of the storybook reading activities were scored using the parent behavior categories of the Responsive Adult-Child-Engagement During Joint Book Reading Scale (RACED-JBR; DesJardin et al., 2014). This scale was found useful in the present study because it reflected many of the interactive reading strategies that were taught in the program and was used before in a study with young DHH children (DesJardin et al.). The RACED-JBR is an adaptation of the *Adult–Child Interactive Reading Inventory* (DeBruin-Parecki, 2007), which was developed for preschool children. The RACED-JBR was developed for a younger population than DeBruin-Parecki's inventory. Further, DesJardin et al. (2014) used this scale in studying the interactive reading behavior of parents of DHH children. The categories defined by DesJardin et al. are (a) engagement (6 items: sustaining attention, providing positive feedback, using emotional language, promoting and maintaining close proximity, and engaging child in interaction); (b) literacy strategies (4 items: pointing to pictures/objects in the book, posing and soliciting questions about book content, pointing to words and letters, and referring to characters); (c) teacher techniques (5 items: relating a story to child's personal experience, elaborating on a child's ideas, defining new vocabulary, soliciting predictions, and reviewing beginning, middle, and end of book); (d) interactive reading (5 items: following a child's lead, giving the child the opportunity to hold the book, using appropriate speed and volume of speech, responding to the child's vocalizations, and allowing time to observe, process, and respond). We made slight adjustments to the parent categories *literacy strategies* and *teacher techniques*: we left out the items *refers to characters or setting* and *reviews beginning, middle, and end of book* because these aspects were less addressed in the program. This resulted in three items for the parent category *literacy strategies* and four items for *teacher techniques.* The complete observation scale can be found in DesJardin et al. (2014).

Each item on the RACED-JBR could be scored from 0 to 3. A score of 0 was given when there was no evidence of the behavior, a score of 1 when the behavior occurred infrequently (<49% of the time), a score of 2 when it occurred some of the time (50-79% of the time), and a score of 3 when it occurred most of the time (≥80% of the time). Each item was scored separately, and total scores were calculated for each category by summing the scores of the individual items. A total parent interactive reading score was calculated by summing the categories. The maximum parent total score would be 54. The category scores and total score were used to examine differences between groups and over time.

The researchers scored the videos on the occurrence of the behaviors in the observation scale. One of the researchers was skilled in sign language to score the videos in which sign language was used without speech; this was the case for only one child. The researchers scored five videos (6%) together, so that they could discuss the rating scale of the items. Eleven additional videos (13% of all videos) were coded by both researchers independently of each other. Their scores for these videos were used to calculate the interrater reliability. A two-way mixed, absolute agreement, single-measures intraclass

correlation (ICC, McGraw & Wong, 1996) was used to assess the degree to which coders agreed in their ratings of parent and child reading behavior. The resulting ICC was in the excellent range, ICC = 0.92, indicating that there was a high degree of agreement between the coders.

**Statistical Analyses**

Because of the small sample size and unequal sample sizes between the experimental and comparison group non-parametric tests were used to measure the effects of the interactive reading program. Non-parametric one-tailed Wilcoxon signed ranks tests were used to examine differences in category scores and total score between pretest, posttest 1, posttest 2, and follow-up in the experimental group. Gain scores were calculated between pretest and posttest 1 scores to examine differences in the amount of progress over time between the experimental and comparison group.

## RESULTS



**Effect of the interactive reading program**

Table 3 shows the mean scores of the experimental and comparison group at pretest and posttest 1. At pretest no significant differences were found between the experimental and comparison group for all categories and the total score. To examine whether over time the experimental group made greater progress in applying the interactive reading strategies than the comparison group, gain scores were calculated by subtracting the scores at pretest from the scores at posttest 1. The gain scores were larger in the experimental group than in the comparison group for *total parent behavior* ($Z$ = -2.49, $p$ = .006), *engagement* ($Z$ = -2.41, $p$ = .008), *teacher techniques* ($Z$ = -1.66, $p$ = .046) and *interactive reading* ($Z$ =-2.07, $p$ = .019). No differences in improvement were found for *literacy strategies* ($Z$ = -1.01, $p$ = .16).

**Table 3.** Scores of the RACED-JBR by group

| | **Experimental group n = 18** | | **Comparison group n = 10** | |
|---|---|---|---|---|
| | Pretest M (SD) | Posttest 1 M (SD) | Pretest M (SD) | Posttest 1 M (SD) |
| Engagement | 10.56 (3.01) | 12.72 (3.2) | 11.40 (3.41) | 10.20 (3.93) |
| Literacy strategies | 3.66 (1.28) | 3.67 (1.8) | 4.10 (1.37) | 3.50 (1.84) |
| Teacher techniques | 1.56 (1.42) | 3.61 (3.20) | 0.80 (1.03) | 0.90 (0.99) |
| Interactive reading | 7.61 (3.71) | 10.28 (4.01) | 7.30 (3.26) | 6.80 (3.46) |
| Total behaviors | 23.39 (7.20) | 30.27 (9.89) | 23.60 (6.02) | 21.40 (7.28) |

*Note.* M = mean, SD = standard deviation.

To examine the effect of the interactive reading program in the experimental group, we compared the mean scores on the parent behavior categories at pretest and posttest 1 (see Table 4). Statistically significant differences emerged in terms of *total parent behavior* (*Z* =-2.68, *p* = .003), *engagement* (*Z* =-2.26, *p* = .012), *teacher techniques* (*Z* = -2.51, *p* = .006), and *interactive reading* (*Z* = -2.33, *p* = .010), with parents achieving higher scores after participating in the interactive reading program. No differences were found between pretest and posttest 1 for *literacy strategies* (*Z* = -0.45, *p* = .482).

To examine whether the effect of the interactive reading program lasted after the books were returned, we conducted a comparison between pretest and follow-up (see Table 4). The results indicated positive changes in all categories and in the total score: *total parent behavior* (*Z* = -2.76, *p* = .011), *engagement* (*Z* = -2.00, *p* = .022), *literacy strategies (Z* = -1.90, *p* = .029), *teacher techniques* (*Z* = -2.11, *p* = .017) and *interactive reading* (*Z* =-1.85, *p* = .032). The program was effective in positively changing parent interactive reading behavior.

**Changes in interactive reading behavior over time**

After the last session of the interactive reading program parents received five books and the associated fact sheets with tips and suggestions for reading for a period of five weeks. After these five weeks they returned the books and received five different books, also for five weeks. To examine the effect of practicing with these books, we compared parents' reading behavior scores at posttest 1 and posttest 2 (see Table 4). Differences were found between posttest 1 and posttest 2 for *total parent behavior* (*Z* =-2.03, *p* = .021), *engagement* (*Z* =-1.78, *p* = .037), and *interactive reading* (*Z* = -1.90, *p* = .03), with parents achieving higher scores at posttest 2 than at posttest 1. Over time parents further improved their interactive reading behavior. No differences were found for *literacy strategies* (*Z* = -1.59, *p* = .056) and *teacher techniques* (*Z* = -.90, *p* = .181).

To examine changes in parents' reading behavior after returning the books, we compared parent behavior at posttest 2 and at follow-up (see Table 4). There were no changes in parents' behavior between posttest 2 and follow-up as regards *engagement* (*Z* =-.31, *p* = .376), *literacy strategies* (*Z* = -.71, *p* = .240), *and interactive reading* (*Z* = -1.57, *p* = .058).

**Table 4.** Pretest, posttest1, posttest2 and follow-up scores of the RACED-JBR for the experimental group

| | **Pretest n =18** | **Posttest 1 n =18** | **Postest 2 n =18** | **Follow-up n =13** |
|---|---|---|---|---|
| | M (SD) | M (SD) | M (SD) | M (SD) |
| Engagement | 10.56 (3.01) | 12.72 (3.27) | 13.83 (3.31) | 13.69 (3.79) |
| Literacy strategies | 3.66 (1.28) | 3.66 (1.84) | 4.39 (1.24) | 4.46 (1.39) |
| Teacher techniques | 1.56 (1.42) | 3.61 (3.23) | 4.17 (2.68) | 3.15 (2.30) |
| Interactive reading | 7.61 (3.71) | 10.28 (4.01) | 11.83 (3.15) | 9.6 (3.95) |
| Total behaviors | 23.39 (7.20) | 30.28 (9.88) | 34.22 (7.68) | 30.92 (8.85) |

*Note.* M = mean, SD = standard deviation.

Parent behavior scores did change at follow-up for *total parent behavior* ($Z$ =-1.89, $p$ = .020) and *teacher techniques* ($Z$ =-2.06, $p$ = .029), with lower scores at follow-up than at posttest 2. Although these scores were lower than at posttest 2, they were still higher than at pretest.

## DISCUSSION

Interactive reading is an important parent-child activity to promote children's emergent literacy skills. This is especially important for DHH children because they are more at risk for language and reading difficulties. Because most parents are not used to applying interactive reading strategies during storybook reading, interactive reading programs have been developed to train parents in applying these skills. In the present study we examined how an interactive reading program designed for parents of young DHH children affected these parents' behavior during storybook reading. The results were promising: parents of young DHH who participated in the reading program increased their interactive reading behavior. Their total scores on the observation scale increased after the interactive reading program and continued to increase through posttest 2. However, parents do not apply all categories to the same extent and the increase in using the strategies varied between categories.



In the category *interactive reading*, parents' use of strategies – such as following a child's lead, giving the child the opportunity to hold the book, using appropriate speed and volume of speech, responding to the child's vocalizations, and allowing the child time to observe, process, and respond – increased after the program and continued to increase through posttest 2. These are important strategies, not only to promote emergent literacy but also to promote parent-child interaction. Earlier studies on parent-child interaction (see Pressman, Pipp-Siegel, Yoshinaga-Itano, & Deas, 1999 for an overview) have indicated that hearing parents of DHH children are more directive and dominant in the interaction than parents of hearing children. Our finding that parents used more interactive reading strategies, such as following a child's lead, after the program may have a beneficial effect on the parent-child interaction in general.

In line with our expectations, we also found an increase in *engagement strategies* such as sustaining attention, providing positive feedback, using emotional language, promoting and maintaining close proximity, and engaging the child in interaction. Research has indicated that these strategies are related to children's expressive language skills (Trivette et al., 2010). Parents in both the reading program group and the comparison group already achieved relatively high scores on engagement before the start of the program. These findings are in line with DesJardin et al. (2014), who also reported relatively high scores on the *engagement* category of the RACED-JBR in parents of young DHH children. Given that all children and their families in the current study were participating in a family-

centered early intervention program, it is possible that these engaging strategies had already been taught to the parents by early interventionists. However, the results of the present study indicate that participating in the reading program further strengthened the use of these strategies.

Although the parents in the reading program group made progress in their overall interactive reading behavior, some aspects of interactive reading were still not applied very often. The scores on *teacher techniques* and *literacy strategies* were relatively low. For *teacher techniques* (elaborating on a child's idea, relating the story to personal experiences, soliciting predictions, and defining new vocabulary) the score increased after the program, but parents' scores were still very low (3.61 out of a maximum of 12). Some of the lower scores in these categories may have been caused by the fact that some aspects did receive less attention in the interactive reading program than others. For example, in the category *literacy strategies*, pointing to letters, words, or sentences did not receive much attention because the children were quite young (60% of the experimental group was younger than three years of age at the start of the study). This aspect of literacy strategies becomes more important at a somewhat later age (four to six years), when children start to learn to crack the code of written language (Ehri, 2005). However, the lower scores on this category may also indicate that parents find these strategies less intuitive. As for pointing to print, past research showed that parents do not typically do this during storybook reading with young children (Chang, Luo, & Wu, 2016; Ezell & Justice, 2000; Justice, Pullen, & Pence, 2008). Given that all these interactive reading behaviors are of relevance for children's literacy skills (DeBruin-Parecki, 2009), interactive reading programs for DHH children should focus more on practice with these strategies. Video-feedback intervention could perhaps be useful in enhancing these skills in parents. In a recent study, video-feedback intervention was shown to be effective in enhancing parent-child communication in parents of young DHH children (Lam-Cassettari, Wadnerkar-Kamble, & James, 2015). Although video-feedback techniques were used in the last session of the current program, it might be effective to make use of these techniques in all sessions.

The use of literacy strategies (pointing to pictures and objects in the book, posing and soliciting questions about the book content, and pointing to words, letters, and sentences) did not improve directly after participating in the program. Parents' use of these strategies did not significantly increase between pretest and posttest1. After posttest 1 a gradual increase in parent behavior occurred, almost reaching significance between posttest 1 and posttest 2 and with a significant difference between follow-up and pretest. This may indicate that parents need more time and practice to adopt these strategies. Another explanation might be that parents intuitively adapted their use of *literacy strategies* towards the end of the study because their children got older in the 22-28 weeks between pretest and follow-up. A recent study on interactive storybook reading in Taiwan showed that 42 mothers increased their pointing to print in books over time (Chang et al., 2016).

In this study interactive storybook reading activities were video recorded and analyzed when children were 1;2, 2;2, and 3;0 years of age. Although parents pointing behavior was relatively low, they pointed more often to printed text when their children were three years old than when they were one or two years old. No increase in pointing to print was found between the ages of one and two. The researchers explained these results by arguing that the mothers were sensitive to the development of their children and fine-tuned their interaction strategies to the growth of their children. Possibly, this adaptation of parent behavior when children get older explains the late changes in parents' use of *literacy strategies* in the current study.

Another interesting result of our study was that parents' scores for total parent behavior and for teacher techniques increased or remained stable until posttest 2, but then decreased somewhat at follow-up. In both cases, the scores at follow-up were still significantly above the pretest scores. An explanation for the decrease at follow-up could be that parents returned the books and the fact sheets to the early interventionist after posttest 2. Perhaps parents need continuous and explicit reminders to apply these strategies.



**Limitations and suggestions for future research**

One limitation of the present study is that we focused on changes in parents' behavior after they had participated in an interactive reading program specially designed for parents of young DHH children. Although we found positive changes in parent behavior, changes in children's literacy or language skills were not examined. The main goal of interactive reading programs is to promote children's interest in reading, to enhance children's emergent literacy and language skills by changing parents' reading behavior. In this study our interactive reading program positively affected parents' interactive reading behavior. On the basis of earlier studies showing interactive reading to be positively associated with the vocabulary skills, narrative skills, phonological awareness, and print knowledge of both deaf and hearing children (Bus et al., 1995; Fung et al., 2005; DesJardin et al., 2014; Trivette et al., 2010), we assume that the current program would also positively affect children's emergent literacy skills.

Fung et al. (2005) examined the effect on receptive vocabulary skills, but only in older children (five- to nine-year-olds). Future studies should also examine how interactive reading programs for young DHH children affect child outcomes. However, when children and their parents are part of a total early intervention program, it is much harder to examine the effects of a specific constituent program. Because the parents and children receive so much treatment and guidance, it is almost impossible to filter out the specific effects of an interactive reading program.

Another limitation concerned the program fidelity. Although the trainers followed a training and used the program manual to teach parents the interactive reading strategies during the session, we did not monitor the fidelity of the program. In future research, observations during the sessions and checklists could be used to monitor the fidelity.

An additional limitation of the present study is that it was not possible to guarantee complete blind coding of the videos. The children and parents in the experimental group were videotaped more often than the ones in the comparison group. Also, in one of the videos the parents and children in the experimental group were reading on an iPad. As soon as a coder sees more than two videos of a parent-child dyad or sees that they read on an iPad, he/she may be biased in his or her judgment. The only solution for this problem, which should be considered for future research, would be a much larger group of coders who were not informed about the purpose and methodology of the study.

It may not be realistic to expect all parents to participate in an interactive reading program. Therefore, it would be relevant to examine different conditions to teach parents the interactive reading strategies. For example, by comparing participation in training sessions versus solely providing books and fact sheets. Further, in this digital era it would be interesting to compare an e-learning program with live training sessions. Future studies could compare different conditions to teach parents the use of interactive reading strategies.

Another limitation of the present study is the missing data on the parent reports about parents' interactive reading behavior during the study. Parents were asked to fill in a diary about their interactive reading behavior, for example about the frequency of reading storybooks with their child, their experiences, and the enjoyment and engagement of their child during reading. However, parents did not succeed in filling in theses diaries for all weeks. The frequency of storybook reading is related to children's literacy skills (Bus et al., 1995; Senechal & Young, 2008), and it would have been interesting to find out if the program also increased frequency of reading. Future researchers could consider interviewing parents before and after participating in a program in order to prevent this problem of missing data.

**Conclusions**

In the present study we focused on parent-child interactive storybook reading because of its proven positive effects on DHH children's emergent literacy skills (Fung et al., 2005; Aram et al., 2006; DesJardin et al., 2009; DesJardin et al., 2014). However, storybook reading is not only beneficial for children's language and literacy skills, but also for their social-emotional development. Storybook reading has the potential to bring perspectives of different characters and mental state language into a child's mind (Adrian et al., 2007). Because DHH children are more at risk for social-emotional difficulties (Stevenson et al., 2015), storybook reading may also be effective in promoting this developmental area.

Interactive reading programs to enhance parents' interactive reading strategies should be incorporated in early intervention. However, participation in an interactive reading program alone is probably not enough to ensure that parents increase and maintain their use of

interactive reading strategies. Early interventionists could play an important role in promoting storybook reading and parents' use of the interactive reading strategies. The strategies need to be modeled, taught, and monitored for continued use by early interventionists during their regular house-visits in order to be effective. Further, they could lend parents books and fact sheets with tips and suggestions about how to keep interactive storybook reading alive.

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## APPENDIX

**Fact sheet: Interactive storybook reading**

**What is interactive storybook reading?**
In interactive storybook reading the child is actively involved in the story. Children learn to think about the story and are stimulated to talk about it in their own words. Storybook reading becomes more fun and promotes the language and socio-emotional development. In interactive storybook reading, you do not always read the exact text in the book, but you tell the story in such a way that it relates to the child's experiences and to what the child is attracted to in the pictures. Interactive storybook reading is divided in 5 steps.

**Step 1: Planning**
Make sure you have gone through the book before you read it with your child and decide what you will and what you will not talk about. What parts of the book will your child specifically enjoy, which parts are funny or exciting? Do you have materials or toys related to the story that you can use to bring the story to life? What activities can you undertake with your child to let him/her experience the story more? If necessary, look up the signs that you want to use. Children's storybooks are often written around a certain topic or problem. Maybe your child has experienced a similar thing that you can talk about or play it out together.



**Step 2: Introduction**
Storybooks often have a beautifully designed cover. This illustration tells you something about the main character or the topic of the story. By discussing the cover and the title of the book, your child can get an idea of what the story will be about before you start reading it together.
Singing a song or playing a game related to the topic can also be an introduction to reading a storybook. For example, if the storybook talks about something that is lost, you can introduce it by playing hide and seek. Or when you have recently visited a (petting) zoo, you can refer to that visit and introduce a book about animals.

**Step 3: Read and tell the story**
Tell the story with your child in your own words/signs. Not only signs, but also gestures can enhance your child's comprehension of the story. Maybe your child will spontaneously talk about something related to book or something in the pictures in the book. Give your child the opportunity to do so and respond to his/her initiatives. Switching between listening and talking strengthens your child's attention to the story. Make sure you ask some open questions about what is in the pictures or about what your child thinks or how he/she feels about the story.
Use mimicry and your body posture to make the story more alive. Children really enjoy this. Storybooks often have many opportunities to impersonate the characters, which is even more fun if you use a hand puppet.

**Step 4: Reflecting on the story**
After reading the book together, talking about it and going through some pages again helps your child in understanding the story and topic. Children often like to play out the story with their own stuffed animals or dolls. Also , you can do an art project with your child about the topic. Making something together gives an opportunity to talk about the topic in a different way than during storybook reading. . Looking at the topic from different perspectives increases comprehension.

**Step 5: Relating events to the story**
The last step "relating events to the story" involves events that take place later. By relating these events to the story, the topic of the book is discussed in a different way. These can be small things, for example, when you are walking in the rain with your umbrella you can refer to the story you read about an umbrella and pointing out the similarities between the story and your walking in the rain. This helps your child in better and more deeply understanding the story, relating it to the real world, and it benefits his/her language development.

**General tips for interactive storybook reading**
- Give your child enough time to look at the pictures, process the information, and respond
- Make sure you pause explicitly to check what your child looks at or spontaneously talks about. You can then connect to what your child is interested in and add information.
- Use mimicry, body language, gestures, and signs to impersonate the people or animals from a story and clarify or stress events in the story. Body language, facial expression, and gestures/signs match the language development of young children. They really enjoy looking at it and will try to copy you.
- Point at the pictures while you are telling the story.
- Children enjoy going through the pages of a book, forward or backward. They like to look back to see what exactly happened or whether the picture matches the story. Repetition is important in learning.
- Ask questions that invite your child to think about the story, not just the what, where, and who questions, but also the how and why questions. If your child does not know the answers yet, you can answer them yourself by telling your child what you think.
- Make sure you adapt your speed to your child and pause timely for your child to process the information. Adults often tend to go faster than children's mind can process.

**To conclude**: Have fun in interactively reading a storybook with your child!

CHAPTER 7

# DISCUSSION

For decades children with moderate hearing loss (MHL) were "forgotten children". Most research focused on children who were profoundly deaf, and the needs of children with MHL were underestimated by researchers, professionals, and parents (Moeller, 2007). In recent years, there has been increasing attention in the literature for young children with MHL. Most of these studies have focused on the language abilities of toddlers with MHL (e.g., Ambrose et al., 2014; Koehlinger et al., 2013; Netten et al., 2016; Stika et al., 2015; Tomblin et al., 2015), and a few studies have examined social-emotional outcomes in preschoolers (Laugen et al., 2016; Netten, 2017). The overall aim of this thesis was to expand our current knowledge regarding both the language and social-emotional outcomes of toddlers with MHL, in the context of their caregiving environment.

The model of inconsistent access (MIA) developed by Moeller and Tomblin (2015) was used as a framework for the present research about the psychosocial functioning of toddlers with MHL. MIA posits that children with HL experience limitations in their access to linguistic input, and that this leads to a reduction in linguistic experiences, which will have a negative impact on their language outcomes. Moeller and Tomblin sought to identify factors that may influence children's access to linguistic input and discerned three main factors: audibility, use of hearing aids (HAs), and linguistic input provided by caregivers. Further, they conceptualized the influence of audiological and educational interventions in their model. The prime emphasis in their studies was on audiological interventions (provision of HAs). In the current thesis we expanded MIA by adding social-emotional experiences and outcomes to the model (see Figure 1). Moreover, we added a new emphasis on the caregiving environment and family-centered early intervention (FCEI).

Four of the studies included in this thesis were conducted in one sample of children with MHL. These children were between 17 and 45 months of age. They were identified by neonatal hearing screening and all used hearing aids. In addition, all but one were enrolled in FCEI. A fifth intervention study was conducted in parents of children with moderate to profound HL. In all five studies we included both children with parents with NH *and* children with parents with HL. Many previous studies excluded children with parents with HL, which may have caused a bias in their samples.

All four studies on toddlers with MHL were focused on their language outcomes; in addition, two studies also described the toddlers' social-emotional outcomes (**Chapter 2** and **Chapter 3**). The remaining chapters examined factors related to the caregiving environment, such as parental stress (**Chapter 3**), parent-child interaction (**Chapter 4)**, and parental linguistic input (**Chapter 5)**, focusing particularly on associations between the caregiving environment, child language, and social-emotional outcomes. In the fifth study, we investigated how an interactive reading program affected parents' use of language-evoking strategies during storybook reading (**Chapter 6**).

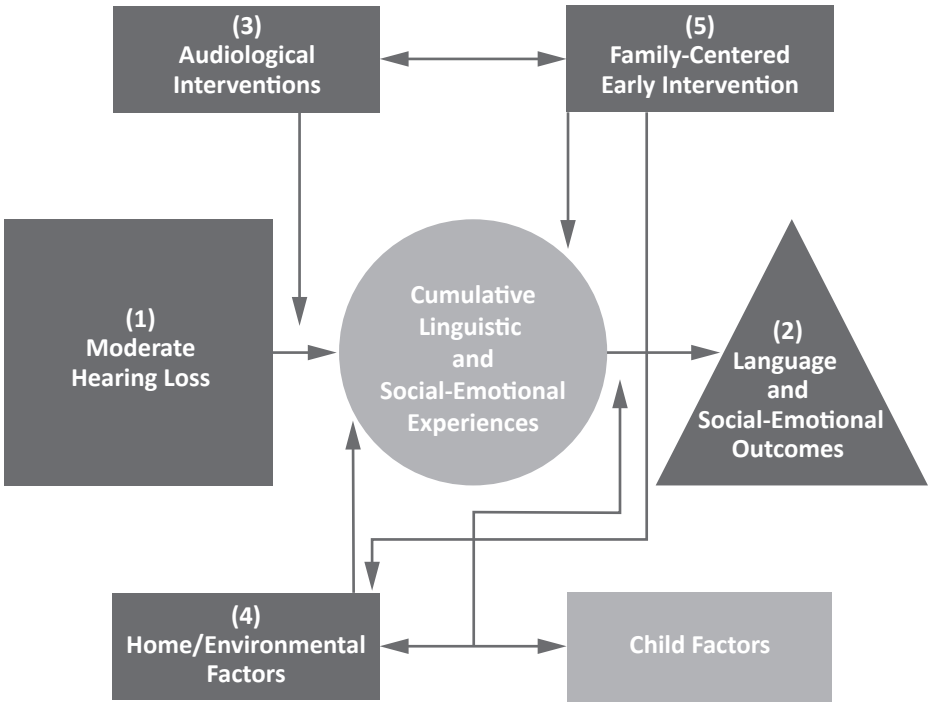


**Figure 1.** The expanded model of inconsistent access based on Moeller & Tomblin (2015)



**Language and social-emotional outcomes of toddlers with MHL**

MIA posits that children with MHL (see Figure 1, box 1) have inconsistent access to linguistic and social-emotional input, and that this places them at risk for language and social-emotional difficulties (Figure 1, box 3). Moeller, Tomblin, and colleagues (2015) found support for this hypothesis in their longitudinal study on the language outcomes in children with mild to severe HL. At first glance, the results described in the present thesis do not seem to confirm these difficulties. When we compared the language outcomes of the children with MHL in our study with those of normative samples, the findings were positive; MHL children's language scores were within the average range (but on the lower end of the scale).

Nevertheless, within our study, the language scores achieved by the children with MHL were lower than those of the children with NH. Given that children from higher socioeconomic status families are known to have higher language abilities (Hart & Risley, 1995), the high score relative to normative samples may be due to the relatively high socioeconomic status of the children in our sample. Approximately 40% of the mothers in our study (in both groups) had a high educational degree, compared to 28% of the Dutch population in general (CBS, 2013). This suggests that the comparison of our MHL

group with the NH group within our study is more representative. Consequently, taking into account the socioeconomic status of the participants, although the MHL group's language scores were within the normal range, they seem to fall behind the NH population.

This line of reasoning is consistent with the findings by Moeller and Tomblin (2015) concerning children with mild to severe HL. Those researchers also reported language scores within the normal range with regard to standard achievement tests, but lower than the socioeconomically matched group of children with NH (Tomblin et al., 2015A). Tomblin et al. (2015B) already questioned solely relying on comparisons with standardized test norms in judging the developmental outcomes of children with HL. They argued that comparison with children from similar home backgrounds might be more realistic. In that perspective we may also conclude on the basis of our findings that children with MHL are indeed at a higher risk for language difficulties.

The studies on social-emotional outcomes described in this thesis are among the first to report outcomes in this domain in a sample of young children with MHL. Based on MIA, we would expect children with MHL to have fewer opportunities to learn about the emotions, intentions, and desires of other people, which would result in poorer social-emotional outcomes, such as difficulties in Theory of Mind (ToM) development. ToM, the ability to understand that other people's feelings and thoughts may be different from one's own, is crucial for children to engage successfully in interactions with others (Denham, 2003). In this thesis we examined some precursors of ToM, such as intention understanding and joint attention during observation tasks (**Chapter 2**). Children with MHL, aged 29 to 32 months, had more difficulties in understanding other people's intentions and exchanged fewer social-communication cues (e.g. eye contact and smiling) during episodes of joint attention than children with NH. In a recent study by Netten et al. (2017), the ToM development of three- to five-year-olds with MHL was found to lag behind children with NH. The current findings suggest that these difficulties are already evident in toddlerhood and provide support for the hypotheses of MIA.

In addition to these precursors of ToM (i.e., indicators of early cognitive empathy), we also examined affective empathy, i.e., whether children were affected by the emotions of other people. Affective empathy can already be observed in newborns (McDonald & Messenger, 2011), for example if they start to cry in response to the cries of another baby. Since the capacity for affective empathy is assumed to be innate, we had no reason to assume that this capacity would be affected in children with MHL. The observation tasks that we used in our study showed positive outcomes for children with MHL and confirmed our assumption: no differences were found between children with MHL and NH children, which was also confirmed by parent reports.

In sum, although children with MHL felt touched by another person's emotions (affective empathy), they had more difficulties in understanding other people's intentions (cognitive

empathy). Both affective and cognitive empathy are needed to support a friend in distress. Not understanding the causes of other people's distress could seriously harm relationships, especially when children grow older and more socially adapted behavior is expected from them (Rieffe et al., 2017). Lower levels of cognitive empathic behavior may therefore result in difficulties in interacting with other people when children with MHL grow up.

In addition to these child tasks and child observations, parents were asked to rate their children's social-emotional functioning through questionnaires (**Chapter 3**). Parents of children with MHL reported similar levels of behavioral problems (externalizing, internalizing, and dysregulation) in their children compared to parents of children with NH. Parent reports thus suggested that having MHL did not affect social-emotional outcomes; however, the observation measures used in **Chapter 2** showed a less positive picture.

One explanation for these differing conclusions concerns the research methods used: parent reports versus observation by researchers. These two kinds of informants do not necessarily give the same kind of information. For example, a parent observes the child in his/her daily interactions with family members and friends, whereas a child observation task is usually carried out by a trained researcher who is not familiar to the child. A meta-analysis on cross-informants correlations concerning behavioral and emotional problems showed low correlations between parent reports and trained observers (Achenbach, McConaughy, & Howell, 1987). In our study, different social-emotional constructs were measured during the child observations than in the parent reports. Whereas the parent reports had a more problem-focused orientation (dysregulation, internalizing and externalizing behavior problems), the child observation measures reflected common daily social behaviors during in vivo interactions. It is also important to note that the children were relatively young, whereas social-emotional behavior problems become more apparent at an older age and when children engage more with peers. Social-emotional behavior problems may lie ahead for these children with MHL if they have difficulties in understanding their peers' intentions. Therefore we conclude that children with MHL are at risk for poorer social-emotional outcomes.



**Caregiving environment**

In the model of inconsistent access, home and environmental factors such as **parental stress, perceived social support, parental interaction skills**, and **parental hearing status** are identified as factors that are likely to contribute heavily to the language and social-emotional outcomes of children with MHL (see Figure 1, box 4). Raising a child with MHL brings multiple challenges for parents, who often have no prior experience with HL. Parents have to adapt their communication strategies, are often confronted with choices about hearing aids, and may have concerns about their child's future development. Therefore, raising a child with MHL might be more demanding and stressful for most parents than raising a child with NH.

Previous studies have, in general, not found elevated **stress levels** in parents of children with mild to profound HL compared with parents of children with NH (Hintermair, 2000; Pipp-Siegel et al. 2002; Topol et al., 2011; Stika et al., 2015). However, none of these studies focused specifically on children with MHL and their parents. In this thesis we examined parental stress in parents of 17-to-33-month-old children with MHL (**Chapter 3**). In line with the previous studies we found that – based on a comparison of group means – parents experienced similar levels of parental stress to parents of children with NH. These positive findings may be due to the fact that all but one of the children in our study and their parents were enrolled in an FCEI program. Early interventionists visit the families in their homes on a regular basis, providing them with information and emotional support. This may prevent or reduce parental stress in families with a child with MHL.

Another way to examine these scores is to take into account individual differences within the groups. Depending on various situational, intra- and interpersonal factors, some parents may not experience any stress, whereas others – including parents with normal hearing children – may feel much more stressed. In line with other studies, when individual differences in parental stress levels (in the parents of both the MHL and the NH children) were examined, these levels were indeed related to children's language and social-emotional outcomes in both groups (Pipp-Siegel et al. 2002; Hintermair, 2006; Quittner et al., 2010; Topol et al., 2011; Stika et al., 2015). In fact, the current findings revealed that parents who perceived higher levels of parental stress reported more internalizing, externalizing, and dysregulation behavior problems and less competence in their children. Also, parents who perceived higher levels of parental stress had children with lower language abilities. But these findings are irrespective of children's hearing status. Because our study had a cross-sectional design, the causality of the associations found remains unclear and could be bi-directional.

Apart from the study by Hintermair (2006), the current study is one of the first to examine **perceived social support** in relation to parental stress in parents of children with HL. Social support can act as a buffer against parental stress, and the current findings indeed indicated that parents who felt more supported by their social network perceived lower levels of parental stress. However, parents of children with MHL felt less socially supported by their family and friends than parents of children with NH. This latter finding might result from the tendency to underestimate the needs of children with MHL. For family and friends the impact of MHL may be less clear because children with MHL often react to sounds and speak relatively well. Consequently, friends and family may be less supportive towards parents of children with MHL than these parents might wish.

Another factor concerning a child's home included in the MIA is **parental interacting skills**. In this thesis we focused on three aspects of parental interacting skills: **emotional availability**, **joint engagement**, and **parental talk**. Emotional availability refers to quality of the emotional connection between parent and child. On the part of parents this conveys

parents' sensitivity to be affectively available and appropriately responsive to their children's signals.

A study on deaf children with cochlear implants showed lower levels of **parental emotional availability** compared with parents of children with NH (Quittner et al., 2013). Furthermore, this aspect of parent interacting skills was positively associated with children's language development. These findings were partly confirmed in our study on the emotional availability in the parent-child interactions of 29-to-45-month-old children with MHL and their parents (**Chapter 4).** We also found higher levels of emotional availability to be associated with better child language outcomes. However, in contrast to the findings in children with cochlear implants, our observations revealed that parents and children with MHL were as available to each other as parents and children with NH. Since emotional availability is an important aspect of attachment (Biringen, 2017), we can tentatively assume that having MHL does not negatively affect the fundamental bonding between parents and children.

**Joint engagement** was a second aspect of parental interacting skills that was examined (**Chapter 4**). Joint engagement is the ability to engage a social partner's attention for an object or event to share the experience, and this is related to children's language and social-emotional outcomes (Tomasello, 2003; Cejas et al., 2013). Previous studies have shown that parents and children with HL experience difficulties in establishing and maintaining joint engagement with each other (Lederberg, et al., 1990; Nowakowski et al., 2009; Nittrouer, 2010; Cejas et al., 2013). However, these studies did not focus exclusively on children with MHL. In the current thesis joint engagement was examined in children with MHL, and the results showed similar difficulties to those reported in these previous studies. Children with MHL, aged 29- to 45-months-old, and their parents had briefer episodes of joint engagement than children with NH and their parents.



The fact that these episodes of joint engagement are shorter will probably reduce the children's opportunities for language and social-emotional learning. The results indeed indicated that duration of joint engagement was associated with children's language outcomes. Children with better language abilities were involved in longer episodes of joint engagement. This association is probably bi-directional: if children have better language abilities it is easier to keep the interaction going, and at the same time longer episodes of joint engagement will provide more opportunities to enhance children's language development, resulting in better language outcomes.

A third aspect of parental interacting skills examined in this thesis was **parental talk** (**Chapter 5**). Several studies showed that the quantity and quality of parental talk is related to children's language outcomes (Cruz, et al., 2013; DesJardin & Eisenberg, 2007; Hoff-Ginsberg, 1985; Taumoepeau & Ruffman, 2006; Zimmerman et al., 2009). Quantity of parental linguistic input refers to the number of words and utterances parents to which

expose their children. Quality of parental linguistic input, on the other hand, refers to the way parents talk to their children; researchers often distinguish between low-level and high-level linguistic input. The use of low-level language – such as asking closed questions, using directive language, imitating, and labeling – is believed to be less language-evoking, whereas high-level language use – such as asking open-ended questions, expanding, and recasting – will evoke more linguistic responses in children (Ambrose et al., 2015).

A recent study in children with mild to severe HL showed that their parents exposed them to more low-level language and less high-level language than parents of children with NH (Ambrose et al., 2015). Furthermore, this low-level language was associated with poorer language outcomes, and high-level language was associated with better language outcomes. In this thesis we examined the quantity and quality of parental linguistic input in 29-to-33-month-old children with MHL. In general, the current findings were in line with the results of Ambrose et al.. Parents of children with MHL were shown to be as talkative during a free-play activity as parents of children with NH, but they used less high-level language during the activity. Furthermore, the association between child language outcomes and parental linguistic input was also confirmed in this thesis. Children with poorer language outcomes were exposed to less talk, more low-level language, and less high-level language. The question remains whether parents intuitively adapted their own language levels because of their children's lower language abilities, or whether they provided their children with lower-quality input.

One aspect of high-level language, the use of mental state references, was of particular interest to us because of the reported association with social-emotional outcomes (Devine & Hughes, 2016). Studies have shown that parental mental state language (e.g., use of words such as *think*, *believe*, or *desire*) was related to children's ToM development (Moeller & Schick, 2006). Parents of children with HL were shown to use less mental state language than parents of children with NH (Moeller & Schick; Morgan et al. 2004), which was again confirmed in our study on children with MHL. This finding may be of concern because earlier studies have reported on ToM difficulties in children with MHL (Netten et al., 2017). The active use of mental state language is one way to promote the ToM development of children with MHL

A final aspect of the home and environmental factors in MIA concerned **parent characteristics** such as parental hearing status. In many studies parental hearing status is used as an exclusion criteria, such that children whose parents also have HL are excluded. To prevent a bias in our sample we included both children whose parents also have HL and children of NH parents. In the current study a relatively high percentage of children with MHL had a parent with HL. In a recent study by Wong et al. (2017) on the psychosocial development of five-year-olds with HL, around 18% of the participating children (N = 301) had one or more parents with HL. Interestingly, Wong et al. reported that more children with HAs had parents with HL than children with cochlear implants. Because most children

within the HA group had MHL, this is in line with our finding. Parents' hearing status did not seem to affect our results. Analyzing the data without the children who had a parent with HL revealed the same results. This is in line with the findings of Dammeyer (2010), who reported that parental hearing was not related to the psychological well-being of children with HL.

All in all, in the model of inconsistent access, home and environmental factors (Figure 1 box 4) are believed to contribute to children's language and social-emotional outcomes. During interactions with their parents, children build on their linguistic and social-emotional experiences, and over time these cumulative experiences will enhance their language and social-emotional abilities. In this thesis we examined the extent to which children with MHL had less access to these experiences because of factors in their caregiving environment, and how these factors were indeed related to their language and social-emotional outcomes. The results indicated no difficulties in the affective relationship between parents and children with MHL. This indicates that the basic parent-child bonding is not affected and is thus available to children with MHL. However, the parent-child interactions provided less opportunity for language and social-emotional learning, because these interactions were briefer and linguistically less rich. The caregiving environment was indeed related to children's language and social-emotional outcomes. We suppose this relation to be bi-directional and suggest adapting the model of inconsistent access by adding a connection from language and social-emotional outcomes (Figure 1, box 2) to home and environmental factors (Figure 1, box 4). Based on our finding we stress the need to support parents in optimizing their parental interacting skills.



**Interventions**

In the model of inconsistent access two types of interventions are included: audiological interventions (Figure 1 box 3) and family-centered early interventions (FCEIs) (Figure 1 box 5). Both these types of interventions are believed to affect access to linguistic and social-emotional experiences. Audiological interventions, such as hearing aid provision, improve children's access to speech and sounds and have proved to be effective in promoting children's language outcomes (McCreery et al., 2015). Family-centered early intervention for children with hearing loss is intended to strengthen caregivers' interactions with their children to support children's language and social-emotional development (Moeller et al., 2013). In this thesis the focus was on FCEI, and the only audiological intervention measure taken into account was the age at which hearing aid amplification was introduced.

Several studies showed that an early start of FCEI is associated with better language outcomes in children with HL (Ching et al., 2017; Holzinger, Fellinger & Beitel, 2011; Moeller, 2000; Yoshinaga-Itano et al., 1998, 2001). In the current study, approximately 70% of the children with MHL were enrolled in FCEI within the first six months of life.

We examined whether the child's age at the start of FCEI was related to parental stress (**Chapter 3**) and parental linguistic input (**Chapter 5**). The current findings showed no relation between these variables – with one exception: Age at the start of FCEI was related to parental low-level language use (use of directive language). Children who enrolled early were exposed to more directive language than children who enrolled later. A similar association was also found for the age of hearing aid amplification and use of directive language.

This directive language provided by parents was negatively related to children's language outcomes. While the use of directive language may be positive for young children at the pre-linguistic level, for the next level of language development children need high-level language exposure. This is an important issue that needs to be addressed in FCEI. Professionals should carefully monitor children's language development so that they can adjust their guidance to parents when children reach the next step in their development. They should guide parents in the transition from using directive language to more eliciting language.

**Chapter 6** examined an intervention to promote parent's use of high-level language. One way to expose children to high-level language is by reading storybooks with them. Interactive reading in which the child is actively involved in the reading activity and parents use language-evoking strategies is positively related to literacy and language outcomes in children (Bus et al., 2008). In this study we examined the effect of an interactive reading program on parents' interactive reading behavior. We hypothesized that guiding parents in applying these strategies would expand the language and social-emotional experiences of children with MHL. The results showed that after participating in the program, parents of children with HL used more interactive reading strategies during storybook reading; these strategies included asking open questions, following a child's lead, and engaging the child in the story.

Although we did not directly examine the effect of this intervention on children's outcomes, we may assume that providing them with more experiences will benefit their language and social-emotional outcomes. This thesis contributed to the model of inconsistent access by providing evidence for FCEI on parental interacting skills (Figure 1, box 5)

**Limitations and future directions**

As in any research project, this study had its strengths, but also its limitations which suggest directions for future studies to further increase our knowledge on this particular population. First, the design of the project described from Chapter 2 to Chapter 5 has certain limitations. The sample that participated in these four studies was relatively small, and the relationships between variables we discussed were all based on cross-sectional data. Though for this reason the results should be regarded as tentative, they are

nevertheless important because these studies were among the first to focus specifically on language and social-emotional outcomes in young children with MHL. More replication studies should be undertaken in larger samples to confirm the results and assumptions made on the basis of these findings. Furthermore, longitudinal research is needed to determine the causality of the associations found.

Second, audiological interventions (Figure 1 box 3) such as hearing aid provision are also supposed to affect the access to linguistic and social-emotional outcomes concerns. Effective early use of HAs – properly fitted and worn consistently – has been shown to be an important predictor of language outcomes in children with MHL (McCreery et al., 2015) and it is plausible that this could also contribute to better social-emotional outcomes. Unfortunately, however, we lacked data concerning HA use. Although data on the age of amplification were available, data on the consistent use of HAs and appropriate fitting were lacking. Future research could examine the extent to which a timely and consistent use of HAs also contributes to MHL children's social-emotional outcomes.

Third, the caregiving environment is also considered important for children's linguistic and social-emotional experiences and outcomes. In this thesis parental interacting skills were indeed shown to be related to children's language outcomes. In addition, children with MHL were exposed to less high-quality talk by their parents, which may be interpreted as a risk factor for children's language development. Parents may be too protective of their children and may therefore not provide them with the challenges they need to further develop. Alternatively, it could be argued that parents were in fact sensitive to their children's language levels and intuitively adapted their own language levels to the lower language skills of their child. In that case, the lower level of parental talk might be interpreted as a protective factor for children's language development, avoiding making overly high demands of their children. In future research these possibilities should be further examined, because this kind of new information will be crucial for parents and professionals to adapt their language levels to challenge children with MHL but not overstress them.



Fourth, parental interacting skills were not examined in relation to children's social-emotional outcomes. Future studies could focus on these associations in children with MHL. Specifically, it could be important to investigate the relation between parents' use of mental state language and children's ToM development. Given that parental linguistic input is also important in the ToM development of children with NH (Adrian et al., 2007), children with MHL might rely even more strongly on their parents in this respect, since they will have more difficulties overhearing other sources that provide spontaneous information, such as their siblings or peers.

Fifth, the current thesis focused on the youngest possible age, 17- to 46-month-olds. This implies that we could examine relationships of the MHL children with their parents, but

not yet with their peers. Peer interactions are important for children to learn to collaborate, negotiate, solve problems, and share with others. As children grow up they engage more and more in interactions with peers, for example at school. Children with MHL are confronted with extra challenging social situations at school. For example, classroom acoustics or noisy playgrounds may make it difficult for them to optimally engage with others. It would therefore be crucial to also examine the social interactions of school-age children with MHL, especially in the playground, when children really have the opportunity to play with others. Both the quantity and quality of this play with other children will provide more insight into the social-emotional functioning of children with MHL in daily life. Technologically innovative methods, such as sensor data, could shed new light on MHL children's social participation and subsequent development.

**Clinical implications**

The current findings emphasize the importance of carefully monitoring the outcomes of children with MHL and their families. Monitoring the progress of children with HL is one of the ten best practice principles of FCEI stated in an international consensus paper by Moeller and others (2013). In the Netherlands, almost all organizations that provide FCEI for children with HL and their families collaborate in monitoring these outcomes. Professionals use this monitoring system to evaluate individual children's outcomes and to set intervention goals with parents for the future development of their children. Further, this monitoring system is used to obtain more insight into the group of children with HL in general and into the effects of FCEI.

At the present time, the monitoring system integrates parent reports about children's social-emotional functioning and standardized language tests. In the current thesis the use of these language and social-emotional measures revealed, on average, no difficulties for toddlers with MHL compared with the standardized norm references. However, when the MHL children were compared with children from similar socio-economic backgrounds, risks for language difficulties did indeed emerge. In addition, observations showed that these toddlers encountered challenges in social interactions with others. This latter finding indicates that the current monitoring system should be broadened to include more social interaction measures, including parent-child interaction measures. In addition, it will be important to integrate measures that reflect more enhanced language abilities that are needed in interactions with others, for example the pragmatic use of language.

Promoting children's language abilities is one of the main goals of FCEI, and the current findings highlight once more the importance of stimulating this area of MHL children's development. In addition to providing HAs, professionals should guide parents in using language-evoking strategies. The current results showed that the use of such strategies was positively related to children's language abilities. More attention and guidance should thus be given to supporting parents in using these strategies. The results reported in Chapter 6 show that an interactive reading program was effective in promoting parents'

use of language-evoking strategies. Therefore it is suggested that interactive reading programs should be integrated into FCEI.

Early parent-child interactions are crucial for children's development. However, children with MHL experience some difficulties in interactions with their parents. Interventions to strengthen parent-child interactions are thus important. Video-feedback intervention has proven to be effective in promoting parental interacting skills in parents of children with HL (Casseratti-Lam, 2015). Early interventionists may use this technique during their house visits in order to reinforce positive parental interaction behavior.

Another best practice principle of FCEI is supporting families socially and emotionally, for example by building families' networks (Moeller et al., 2013). The results show that parents of children with MHL tended to feel less supported by their families. Since for the social network the impact of MHL on daily life is not always obvious, friends and family may be less supportive that parents might wish. Professionals can actively support parents by providing information about MHL during meetings for families' social networks.

To conclude: toddlers with MHL experience some challenges in establishing and maintaining meaningful interactions with others. They share fewer social cues with others and have more difficulties in understanding others' intentions. Since these challenges do not emerge clearly if we focus solely on parents' general reports of social-emotional functioning, there is a risk that the needs of children with MHL may be underestimated. In addition, if their language abilities are even within the normal range of standardized language tests, parents and professionals may think that these children are doing well enough to engage successfully in interactions with other people. Consequently, further guidance or monitoring of children with MHL may not seem necessary. However, fine-tuned social skills, especially, are essential in building and maintaining friendships and meaningful relations with others. Holding conversations, supporting a grieving friend, or resolving conflicts are all examples of situations that require these sophisticated social skills. To maximize the outcomes of children with MHL, we should support them in learning these skills.



**Final conclusions**

Research on children with MHL is relatively scant, but the model of inconsistent access (Moeller & Tomblin, 2015) provides a good starting point to examine the specific role of psychosocial factors, both in the children and their parents, in children's language and social-emotional outcomes. In the project described in this thesis, we aimed to contribute to the field by expanding this model of inconsistent access to include social-emotional experiences and outcomes. The overall results indicated no risk factors in the parent-child affective domain: Toddlers with MHL were affected by the emotions of other people, they were affectively available to their parents and their parents to them, and their parents did not feel more parental stress than parents of children with NH. These findings provide

a positive and promising basis to build on the challenges found in the domain of meaningful social interactions. This positive information is important for professionals, but certainly also for parents who are seeking to support the development of their child with MHL, since it can boost parents' confidence in their own important role.

Within their social interactions, toddlers with MHL had more difficulties in understanding the intentions of others and exchanged fewer social-communicative signals. Their parents used less rich and diverse language in these interactions. Sharing emotions, thoughts, and experiences with social partners gives meaning to interactions and teaches children about other people's intentions and perspectives. This social sharing takes time, but toddlers with MHL and their parents were restricted in their time. It was more difficult for them to obtain and maintain their social partner's attention, which led to less time to share. Consequently, there were fewer opportunities for language and social learning.

Interventions should support parents in increasing the time they engage in meaningful interactions with their child. One way to do this is by guiding parents in using interactive reading strategies while reading storybooks their children. Interactive storybook reading is a way to engage both social partners in the interaction and to expose children to a rich and diverse language. This thesis showed that early interventionists could guide parents in reading storybooks this way.

In 1977 Julia Davis referred to the group of children with MHL as a "forgotten group", and although attention for these children has increased in recent years, research on them is still relatively scarce compared to that on deaf children. The present thesis shone a spotlight on children with MHL, which has resulted in more knowledge, but also new questions. I hope that this thesis will encourage others – both researchers and professionals – to keep alive this attention for children with MHL.

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CHAPTER 8

# Nederlandse Samenvatting

In Nederland wordt ongeveer 1 op de 1000 kinderen geboren met een permanent bilateraal gehoorverlies, de helft van deze kinderen heeft een matig gehoorverlies (40-60 dB) (Zoutenbier et al., 2016). Kinderen met een matig gehoorverlies hebben moeite met het horen en/of verstaan van spraak op een normaal niveau van luidheid. Hoewel het dragen van hoortoestellen bijdraagt aan het spraakverstaan is dit in een rumoerige omgeving nog altijd lastig (McGreery & Walker, 2017). Deze beperkte toegang tot spraak en geluid heeft gevolgen voor de ontwikkeling van een kind.

De groep kinderen met een matig gehoorverlies is lange tijd een "vergeten groep" gebleken. In de literatuur werd tot voor kort weinig aandacht besteed aan deze kinderen en het meeste onderzoek richtte zich op dove kinderen (met of zonder cochleair implantaat (CI)). Ook binnen het zorgaanbod lag de focus op dove kinderen. Pas toen de toelatingscriteria tot zorg in 2008 werden verruimd, ontstond er oog voor het matig slechthorende kind. Met de toetreding van jonge kinderen met een matig gehoorverlies tot de vroegbehandeling ontstond al snel de vraag welk zorgaanbod deze kinderen nodig hadden. Om deze vraag te kunnen beantwoorden, was in eerste instantie inzicht in de ontwikkeling van deze kinderen noodzakelijk. Dit promotieonderzoek had dan ook tot doel dit inzicht te verschaffen.

In **hoofdstuk 1** wordt een inleiding gegeven over kinderen met een matig gehoorverlies. Hierbij wordt het *Inconsistent Access*-model van Moeller en Tomblin (2015) besproken dat dient als theoretische basis voor de vraagstukken behandeld in dit proefschrift. Dit model veronderstelt dat kinderen met een matig gehoorverlies inconsistente toegang hebben tot linguïstische *input* en dat dit leidt tot een beperkte *uptake* van taal met negatieve gevolgen voor de taalontwikkeling van het kind. Factoren die van invloed zijn op deze linguïstische input zijn het tijdig en consistent dragen van hoortoestellen, gezinsfactoren en interventies.

Aan de hand van eerdere onderzoeken worden de invloeden van deze factoren uitgelegd. Naast de taalontwikkeling is ook de sociaal-emotionele ontwikkeling van een kind van groot belang voor maatschappelijk functioneren en welbevinden. In hoofdstuk 1 wordt dan ook voorgesteld om het model uit te breiden met sociaal-emotionele ervaringen en uitkomstmaten.

In **hoofdstuk 2** wordt het empathisch vermogen van matig slechthorende peuters beschreven. Het kunnen voelen en begrijpen van andermans emoties is belangrijk in de ontwikkeling van sociaal gedrag (Rieffe et al., 2017). Aan de hand van een oudervragenlijst en observaties werd het empathisch vermogen van matig slechthorende peuters vergeleken met dat van goedhorende peuters. Tijdens een testsituatie simuleerde een testleider drie verschillende emoties (blij, boos en verdrietig) en werden de empathische reacties van de peuters geobserveerd. Hierbij werd de mate waarin peuters geraakt werden door de emotie van de testleider, aandacht hadden voor de emotie en of er sprake

was van sociaal gedrag gescoord. Ook werd aan de hand van observaties nagegaan of zij de intenties van de testleider begrepen bij het uitvoeren van taakjes. Uit de resultaten blijkt dat matig slechthorende peuters mee kunnen voelen met een ander, maar minder in staat zijn de bedoelingen van een ander te begrijpen. Om succesvolle interacties met anderen aan te gaan is het begrijpen van andermans intenties cruciaal. De resultaten impliceren dan ook dat matig slechthorende peuters risico lopen op moeilijkheden in hun sociaal-emotionele ontwikkeling.

In **hoofdstuk 3** wordt onderzocht in hoeverre ouders van matig slechthorende peuters stress ervaren in de opvoeding van hun kinderen. Ouderlijke stress is gerelateerd aan negatieve ontwikkelingsuitkomsten bij kinderen zoals sociaal-emotionele problemen (Crnic, Gaze & Hoffman, 2005) en het is daarom van belang dit tijdig te signaleren. Aan de hand van vragenlijsten werd de mate van stress die ouders beleefden onderzocht en gerelateerd aan de taalvaardigheden en het sociaal-emotioneel functioneren van de kinderen. Daarnaast werd ook de mate van sociale steun die ouders ervaren in kaart gebracht en gerelateerd aan de stressbeleving. Eerder onderzoek heeft namelijk aangetoond dat sociale steun als een buffer kan dienen tegen stress (Hintermair, 2000).

Uit de resultaten blijkt dat ouders van matig slechthorende peuters in vergelijking met ouders van goedhorende peuters een vergelijkbare mate van stress beleven in de opvoeding. Voor beide groepen geldt dat een hogere mate van stress samenhangt met lagere taalbegripsvaardigheden, meer sociaal-emotionele problemen en minder sociale steun. Daarnaast blijken de ouders van matig slechthorende peuters minder sociale steun te ervaren dan de ouders van goedhorende kinderen. Professionals zouden ouders kunnen ondersteunen in het betrekken van hun sociale netwerk in de zorg rondom hun kind.



In **Hoofdstuk 4** staat de interactie tussen ouder en kind centraal en wordt onderzocht in welke mate deze interactie samenhangt met de taalvaardigheden van kinderen. Ouders hebben een cruciale invloed op de ontwikkeling van hun kind. Met name warm, affectief en betrokken ouderschap heeft een positief effect op deze ontwikkeling (Emde, 2000). Uit eerder onderzoek is gebleken dat ouders van dove kinderen met een CI minder sensitief zijn in de interactie met hun kinderen dan ouders van goedhorende kinderen en dat de mate van sensitiviteit een belangrijke voorspeller is voor de taalontwikkeling van deze kinderen (Quitnner et al., 2013). Daarnaast is aangetoond dat dove kinderen (met en zonder CI) en hun ouders minder succesvol zijn in het initiëren en in stand houden van gedeelde aandacht tijdens hun interacties (Barker et al., 2009; Cejas et al., 2014).

Om zicht te krijgen op de ouder-kindinteracties van matig slechthorende peuters werden zij geobserveerd tijdens een vrije spelsituatie in hun thuisomgeving. De mate waarin zowel de ouder als het kind emotioneel beschikbaar was voor de ander werd gecodeerd. Daarnaast werd het tot stand komen en behouden van gedeelde aandacht tussen ouder en kind gecodeerd. De resultaten laten zien dat er geen verschillen zijn in de ouder-

kindinteracties van slechthorende peuters en goedhorende peuters wat betreft de emotionele beschikbaarheid. Meer specifiek, ouders van matig slechthorende peuters tonen eenzelfde mate van sensitiviteit in de interacties als de ouders van goedhorende peuters. Echter, het tot stand komen van gedeelde aandacht en het vasthouden hiervan verloopt minder goed binnen de groep peuters met een matig gehoorverlies. De periodes van gedeelde aandacht zijn namelijk korter dan die van de goedhorende peuters.

Beide aspecten van de ouder-kindinteractie zijn gerelateerd aan de taalontwikkeling van de kinderen. Een hogere mate van emotionele beschikbaarheid en een langere periode van gedeelde aandacht hangt samen met betere taalvaardigheden. Gezien de relatie tussen de ouder-kindinteractie en de taalontwikkeling van een kind is het van belang dat professionals aandacht hebben voor deze interactie en ouders ondersteunen in hun interactievaardigheden.

**Hoofdstuk 5** bouwt voort op de ouder-kindinteractie waarbij de focus ligt op het taalaanbod van ouders. De hoeveelheid woorden die een kind tot zich gericht krijgt, beïnvloedt zijn of haar taalontwikkeling (Hart & Risley, 1995). Hierbij geldt: hoe meer woorden, hoe beter. Echter, het is niet alleen de kwantiteit die ertoe doet, ook de kwaliteit van het taalaanbod is belangrijk (Ambrose et al., 2015). Zowel de kwantiteit als de kwaliteit van het taalaanbod van ouders is onderzocht. De resultaten laten zien dat ouders van matig slechthorende peuters net zoveel praten tegen hun kinderen als ouders van goedhorende peuters, maar de kwaliteit van dit aanbod is minder rijk. De ouders van matig slechthorende peuters gebruiken minder taaluitlokkende strategieën, zoals het stellen van open vragen. Ook gebruiken de ouders minder vaak woorden die betrekking hebben op gevoelens, verlangens en overtuigingen. Deze 'mental state'-taal is belangrijk voor de sociaal-emotionele ontwikkeling van kinderen (Moeller & Schick, 2006).

Het taalaanbod van ouders is ook gerelateerd aan de taalvaardigheden van de kinderen. Zowel de hoeveelheid woorden die ouders gebruiken als een rijker taalaanbod hangt positief samen met de taalvaardigheden van de kinderen. Deze samenhang is waarschijnlijk bi-directioneel; het taalaanbod van de ouder beïnvloedt het taalgebruik van het kind en vice versa zal het taalgebruik van het kind het aanbod van de ouder beïnvloeden.

Een manier om kinderen een rijke taal aan te bieden is door ze voor te lezen. In **hoofdstuk 6** is het effect van een interactieve voorleescursus op het voorleesgedrag van ouders van dove en slechthorende kinderen onderzocht. Voorlezen is belangrijk voor de latere taal- en leesvaardigheden van kinderen (Bus, van Ijzendoorn & Pellegrini, 1995; Mol, Bus, de Jong & Smeets, 2008) en dan met name een manier van voorlezen waarbij het kind actief betrokken wordt bij het verhaal. Het interactieve voorleesgedrag van ouders van dove en slechthorende peuters werd voorafgaand aan de cursus en na afloop gefilmd en gecodeerd. Hierbij werd onder andere gekeken naar het stellen van open vragen, het volgen van het kind en het verhaal relateren aan de belevingswereld van het kind. Ouders laten na afloop

van de voorleescursus meer interactief voorleesgedrag dan vooraf, terwijl ouders die niet deelnamen aan de cursus deze verandering niet laten zien. Tot op heden zijn er weinig studies gedaan naar het effect van interventies op het gedrag van ouders van dove en slechthorende kinderen. Vanwege het positieve effect van de cursus op het voorleesgedrag van ouders wordt geadviseerd de cursus op te nemen in het behandelaanbod voor dove en slechthorende kinderen.

In het afsluitende **hoofdstuk 7** worden de belangrijkste resultaten uit de hoofdstukken twee tot en met zes op een rijtje gezet om een beeld te schetsen van de ontwikkeling van matig slechthorende peuters binnen de context van het gezin. Op basis van deze studies kan geconcludeerd worden dat er geen risicofactoren zijn in het affectieve domein; matig slechthorende peuters worden geraakt door de emoties van anderen en ouders en kinderen zijn emotioneel beschikbaar voor elkaar. Deze positieve resultaten bieden een mooie basis om verder te werken aan de gevonden uitdagingen in de interacties met anderen. Matig slechthorende peuters hebben meer moeite met het begrijpen van andermans intenties en binnen de interacties met anderen en met hun ouders wisselen ze minder sociale signalen uit. Interactief voorlezen is een mogelijkheid gebleken om de interacties van kinderen met gehoorverlies en hun ouders te verrijken. Meer onderzoek naar evidence-based interventies om de ontwikkeling van matig slechthorende kinderen te stimuleren is noodzakelijk. Dit proefschrift heeft bijgedragen aan de inzichten rondom de ontwikkeling van matig slechthorende peuters en heeft tevens nieuwe vragen opgeworpen.

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APPENDICES

# List of Publications
# Acknowledgements
# Curriculum Vitae

## LIST OF PUBLICATIONS

**Dirks, E.,** Stevens, A., Kok, S., Frijns, J.H.M., and Rieffe, C. (submitted). Talk with me! Parental Linguistic Input to Toddlers with Moderate Hearing loss.

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Evelien

## CURRICULUM VITAE

Evelien Dirks (1977) was born in Purmerend. She graduated from the Jan van Egmond College in Purmerend in 1996. Evelien obtained her master's degree in Developmental Psychology from Free University Amsterdam in 2000. Her master thesis, under supervision of Prof. dr. Carolien Rieffe, concerned the emotion understanding of deaf children. After obtaining her Master's degree she started working as a researcher and teacher at the department of Special Education at the Free University Amsterdam. In 2007 she started as senior researcher at NSDSK, the Dutch Foundation for the Deaf and Hard of Hearing Child, where she conducted the research presented in this thesis. In 2013 she combined her research position at NSDSK with a PhD position at the Developmental Psychology department at Leiden University. Under supervision of Prof. dr. Carolien Rieffe and Prof. dr. ir. Johan Frijns she wrote her dissertation. Since 2014 Evelien is a member of the board of Child Psychologists of the Dutch Association of Psychologists and she is the chair of the WAG (board of Auditory and Communicative Impairments) of the Dutch Association of Psychologists. Since 2016 Evelien is a teacher in the postdoctoral education program 'School-psycholoog', course Scientist Practitioner, at the RINO Group Amsterdam. Evelien continues to work as a senior researcher at NSDSK.

Psychosocial Functioning in Toddlers with Moderate Hearing Loss
The Importance of Caregivers